



**Edgewood Chemical Biological Center**  
Aberdeen Proving Ground, MD

Issue 34 Fall 2003

# **ECBC IN THE FOREFRONT OF SUPPORTING SCIENCE AND TECHNOLOGY**



**Senior-Level Positions Filled at ECBC**

**See page 29**

The Edgewood Chemical Biological Center (ECBC) is located at the Edgewood Area of Aberdeen Proving Ground, MD.

ECBC is one of a few of the Army's and Department of Defense's total lifecycle research, development and engineering centers. It possesses a full spectrum of capabilities ranging from basic and applied research, technology development, engineering, system acquisition to fielding and ultimately demilitarization.



This publication is prepared at the Edgewood CB Center.

We publish this information under the auspices of AR 70-45, R&D Scientific and Technical Information Program, which states that "The objective of the S&TI Program is to improve the flow of technical information into, through, and from the Department of the Army in order to:

- (1) Secure economies by reducing RDTE lead time and by eliminating unnecessary duplication of effort,
- (2) Improve RDTE program management and execution, and
- (3) Support the information needs of scientists, engineers, and managers."

AR 70-45 further states "Department of the Army elements will provide for adequate interchange of technical information among themselves and with their contractors, the other military departments and Federal agencies, and, to the maximum extent consistent with national security, the U.S. scientific, technical, and academic communities."

This document is distributed to over 1,500 addressees throughout the Joint Services, industry, and academic R&D community. Please submit articles to Director, Edgewood Chemical Biological Center, ATTN: AMSRD-ECB-AP-B, Aberdeen Proving Ground, MD 21010-5424, or by electronic mail to [cet@apea.army.mil](mailto:cet@apea.army.mil). All submissions are accepted at the discretion of the editor and are subject to editing.

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# BIODETECTION: KEY MISSION OF THE AEROSOL SCIENCES TEAM

By Dr. Ed Stuebing and Tim Lavery

There's a biological agent aloft in the air. It's deadly to all who inhale it, but it can't be seen with the naked eye and it receives camouflage from everything from dust to mold spores. Still, you must find a way to quickly discover the presence and identity of this agent—no small task to protect troops and civilian populations.

This is the challenge posed to ECBC's Aerosol Sciences Team (AST). While the team performs a wide variety of work for the U.S. military's chemical biological defense program, biological detection is perhaps its core mission and major contribution to the nation's science and technology efforts.

"The most important issue facing my team is biodefense," said Dr. Edward Stuebing, head of the aerosol sciences team. "All biological agents are airborne aerosol particles, while most chemical weapons are in a vapor or liquid drop form."

The focus of the Aerosol Sciences Team (AST) test facility is to characterize the aerosol sampling efficiencies of biological and chemical detection systems under development for the U.S. Joint Services. The facility is equipped with a range of unique equipment including test chambers and wind tunnels. The flexibility of the AST facility and the broad experience of team personnel enable it to serve a number of customers from both inside and outside of the joint services in handling aerosol related challenges.

Today, much of that concentrated infrastructure and knowledge is

focused on the threat of bioterrorism. When weaponized by suspending very small particles in air, biological agents are known as aerosols. Aerosol bioweapons are transmitted by airborne means and aspirated into the lungs, where they can transfer into the individual's lymph or blood systems. While biological agents can also be transmitted directly into the bloodstream (i.e., a vaccine) or ingested through the digestive tract, the airborne delivery method would impact the greatest number of people at one time.

"Anthrax is one of the least potent bioweapons, yet it is still 100,000 times more potent than VX, the most potent chemical nerve agent," said Stuebing. "Biological agents can be hazards for many miles downwind, and a very small amount is required...biodetection devices must be able to detect and identify these minute quantities."

The nature of airborne biological agents is that they fall into a very specific size window: too large and they cannot be aspirated into human lungs nor stay suspended in the air for long, and if too small they will pass right back out after being inhaled. Logically, the biodefense thrust is focused on the size of particles that can get and stay inside human lungs. These particles are measured in microns, or millionths of a meter. A human hair is approximately 100 microns and a single grain of pollen is 20 microns or larger—in comparison, the size of a biological particle the AST is looking for is between one and ten microns. The team is focused

on improving our national ability to capture enough particles of this size so they can be analyzed quickly and identified positively.

This size signature gives AST scientists and engineers a starting point for developing aerosol detectors; however, detection equipment must also be able to detect harmful agents in a field full of benign and naturally occurring substances. For example, mold spores are right in the same window as the target agents. Biodetection equipment must be able to discern unique characteristics of things that share a size range. The other significant challenge is of an engineering nature: designing and fielding biodetectors capable of operating in a range of environmental conditions with minimal power and space requirements.

Current point detection technology for biological agents depends on airflow through a collection system. This is known as an inertial collector, which normally includes two key components: an inlet, a collector, and perhaps an aerosol concentrator. AST personnel study airflow characteristics in order to develop inlets that will effectively sort particles by size and weight utilizing ducting that directs the target particles into a collector. The crucial—and most challenging—step in conducting biodetection activities is collecting an adequate amount of agent for analysis. AST members are working to develop inlets that can selectively capture the correct size of biological agent particles from air traveling at relatively high speeds,

such as that encountered by a moving vehicle. The ability to effectively sample high-speed air is a focal point for next-generation detection systems.

“The EPA has stationary sampling stations all over the country using first-generation technology that can handle air moving at five to ten miles per hour,” said Dr. Stuebing, referring to the EPA’s Air Quality Index collectors that provide valuable data to a range of agencies. “That technology worked on fixed-location military systems mounted in or on buildings and parked vehicles, but the next generation must be mobile.”

The purpose of the collector is to gather an appropriate amount of the target agent in the proper concentration for analysis. There is a required concentration of biological sample per unit of collection liquid that must be extracted and concentrated from the air that will allow effective analysis of the particles. Depending on the quantity of the target agent in the air, the collector may have to collect more air and pass it through an aerosol concentrator to increase the concentration of the target agent and let air back out while retaining the target biological particles.

There are functional and operational challenges inherent in this type of system. First and perhaps most significant for military users is the power requirement. Moving this volume of air and extracting small aerosol particles by their inertial properties can require substantial amounts of power, requiring some

kind of generator or power source. This increases the logistical footprint of a biological sampling device. One approach the AST is taking to address this need is developing more efficient collection and concentrating devices—the long-term goal is to double current particle collection efficiency with a simultaneous reduction in required power by a factor of five.

Another path ahead is to develop alternatives to inertial collectors. By nature of their design, inertial collectors require a good deal of acceleration to the airflow. Research is being conducted in electrostatic and acoustic methods of pulling target biological particles out of the surrounding air. Inertial collectors also require a much greater amount of energy as smaller and smaller particles are targeted. In other words, every time the target size is reduced by a factor of two, the power requirement goes up by a factor of as much as eight. This limits inertial collectors on two fronts: power requirement and capability range for collecting the smallest particles. Future biodetectors will address these limitations.

The AST is working to make the next generation of point aerosol detectors able to make higher sample concentrations with greater efficiency using less power. There is promising research going on today towards this end, as well as in the field of standoff biological detection. ECBC’s AST has the experience, equipment and drive to provide biological detection solutions to protect our nation’s warfighters.



*The performance of aerosol collectors is measured inside a large stainless steel aerosol chamber at ECBC.*



# LOW-LEVEL TOXICOLOGY

## *How clean is clean?*

By Dr. Sandra Thomson and Tim Lavery

ECBC's key mission is the protection of the U.S. warfighter in hostile environments. For the Edgewood Center, this translates into providing products that provide personal protection from chemical and biological agents to include the detection of the agents and decontamination systems, a job the center has performed since 1917.

A key element of all this work involves understanding what is a safe level of contamination—or, conversely, how clean is clean. Before scientists and engineers can design, test and prototype a mask or detector, the baseline parameters and thresholds for safe levels of toxicity must be set.

Historically, assumptions relating the impacts of exposure to sarin (GB)—the most studied agent—have been largely limited to exposures of 2- to 10-minutes in duration. Today's technologies, which are far evolved from what existed only a few years ago, allow ECBC scientists to engage in research in a field known as low-level toxicology. Low-level toxicology is the study of the effects of very low concentrations of chemical warfare agents, and consists of the design and execution of studies to generate scientifically valid data to serve as a basis for reducing margins of error in operational risk assessments where health effects of CWA are concerned.

Estimations of human health risks to CW agent exposure are often based on a threshold clinical sign such as miosis (pupil constriction). This is the first noticeable effect following exposure to airborne nerve agent, and it can occur in the absence of any measurable cholinesterase inhibition in the blood. However, individual performance in the presence of CW agent may be impacted before the onset of miosis. Following exposure to very low concentrations of agent vapor, miosis may not be fully manifested for hours after the exposure. In addition, even mild cases of miosis can have significant negative impact on mission performance, particularly for tasks that must be performed in dim light or require near vision.

Modern analysis techniques are providing consistent and defensible data able to significantly reduce the error currently incorporated in estimates of toxicity and in assessing short- and long-term health and performance impacts. This information will also be key to creating

requirements criteria for detector design, personal protective gear and decontamination technologies. The characteristics of adverse health effects of less-than-lethal levels of chemical warfare agents may also provide insight into the nature of possible preventative measures for warfighters.

The Joint Services are focusing their efforts on low-level toxicology through a Defense Technology Objective, or DTO, studying the effects and countermeasures for low-level chemical warfare agent exposure. Dr. Ray Mackay, director of the ECBC Research and Technology Directorate, is the Army representative on the Joint Service panel leading the DTO. ECBC's Dr. Sandra Thomson is the senior team leader for the non-medical portion of this DTO, to which ECBC contributes a substantial number of technicians, analytical chemists, and biologists. The partnership between medical and non-medical military laboratories has proven beneficial for both sides.

"We do cross over and help each other when possible," said Dr. Thomson. "It's a unique expertise our people bring to this collaboration."

ECBC began its low-level toxicology work in 1998, with a focus on detection equipment and determining how low is low when gauging agent presence. This effort was a natural fit for the DTO team, formed in 2002, and much of the early work has segued into the Joint Panel research project.

ECBC is one of the few facilities where scientists can conduct agent inhalation toxicology studies of chemical warfare agents. Within the labs, trials are conducted in special chambers that are constantly monitored to ensure a steady, specific amount of agent in the available air. This is critical because the studies require repeatability with a known concentration and consistent level of chemical agent. Real-time levels are continually read while discrete samples are taken during exposures for traditional sampling and analysis later, which will provide a backup confirmation of the amount and concentration of agent present. This two-pronged approach to maintaining the integrity of the studies will prove important when other scientists and research teams want proof of the validity of these results.

“We are operating at the state-of-the-art for analytical chemistry, and our methods for generating controlled concentration of (agent) vapors are equally advanced,” said Dr. Thomson. “We have to conduct studies at this degree of rigor to ensure our results are scientifically credible.”

The applications for this low-level toxicology data certainly require this high level of confidence and accuracy. The central question is this: what does it mean for the soldier? ECBC investigates this issue in a number of ways, including situational analysis models for conducting risk assessment, and the determination of how long agents survive in the environment under different ambient conditions. Teams developing chemical agent detectors use the data to set new alarm thresholds for their technologies, fine-tuning the detection capabilities to provide the utmost safety for warfighters while maintaining a normal operating environment for as long as possible. The same information is extremely valuable to groups working on new decontamination procedures, as they will have a better understanding of what is an acceptable background concentration of chemical warfare agent. Ultimately, ECBC hopes to help define the long-range impact of extended

exposure to non-lethal levels of chemical warfare agents. The findings will ultimately define new thresholds for future generations of detection and decontamination technologies, as well as fine-tuning risk assessment applications.

The low-level toxicology program at ECBC is tackling a number of challenges over the next few years. These include challenges in finding ways to create and maintain a stable environment for some agents, and cross-validation of all methods of exposure must be addressed in an integrated series of studies. Organizing this wide range of data into a unified framework suitable for conducting risk management activities will require a novel approach to interpreting and modeling scientific findings.

ECBC is well equipped to meet this challenge, with the experts and best facilities in the CB defense research world. The low-level toxicology work at ECBC will serve to fill the toxicological data gaps in the realm of low-level exposure to chemical warfare agents, contributing greatly to the efforts of the Joint Service to keep its warfighters safe and effective.

# PEPTIDES—SYNTHETIC MATERIALS THAT MIMIC PATHOGENIC AGENTS

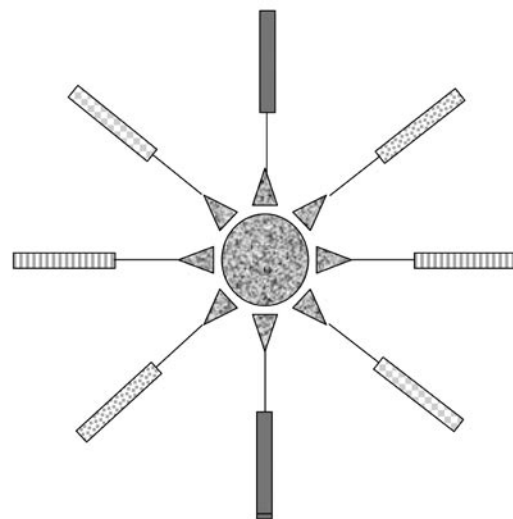
By Tim Lavery

Effective, reliable simulants are crucial to biological warfare defense research, development and testing. Because of their deadly nature, very few facilities can work with actual biological agents. Even at those laboratories certified to handle live biological agents, such as the Edgewood Chemical Biological Center, the logistical challenges to using those agents renders it impractical to use real agent at every stage of research and development. Unfortunately, the verisimilitude of simulants to the real agents they substitute for can sometimes be suspect—in some cases, one simulant must stand in for a variety of different biological agents. With support from the Joint Science and Technology Panel for Chemical Biological Defense, the ECBC's Research and Technology Directorate is working to build better simulants.

"There are some key problems with our current batch of simulants, both in logistics and in adequacy," said Roy Thompson, ECBC's lead investigator. "The simulant for anthrax spores is a major problem, and we're still dependent on using a batch made in the 1950s...we're running out."

Today's researchers face a shortfall in the available quantity, or in quality of representation allowed by existing simulants. Additionally, the high demand for RDT&E with biological agents has led to an increased demand for this dwindling supply. On top of that, there are no good simulants for a number of biological substances, including protein toxins, viruses and a number of vegetative bacteria. Even for the common, widely accepted simulants, there is growing concern that testing with discordant simulants may not accurately predict the actual performance of an instrument under natural field conditions.

ECBC's research program, known as "Combinatorial Peptides as Epitope Mimics," is developing an approach to solving the problems of logistics and adequacy by developing largely synthetic materials that mimic certain unique features of the pathogenic agents. The development of biomimetic simulants holds the promise of one day rendering the use of 'live' biological materials a thing of the past.



*Multigenic peptide mimic of a biological threat agent. Peptides representing different antigenic epitopes are bound to inert core simulating biophysical properties (e.g., shape, size, charge) of the original target.*

"If you can identify the unique molecular fingerprints of an agent -such as anthrax- and put that fingerprint on an inert substance that closely matches the gross biophysical features of the live agent, you should be able to produce a viable simulant that greatly reduces the logistic and QA/QC standardization burdens associated with the current batch of biological simulants," said Thompson.

Current simulants are actual biological products of microorganisms (complex proteins) or microorganisms themselves (bacteria, viruses) and as such, they possess varied environmental and user requirements for maintaining their viability outside the controlled environment of the laboratory. With sturdy chains of amino acids- known as peptides- being the only biological component of an otherwise synthetic material, the logistic tail of manufacturing, storing, shipping and handling simulants could be significantly reduced. Unlike most biological material, peptides are extremely hardy and resistant to environmental challenges of extreme temperatures, pH, organic solvents and aqueous milieus.

The key to this work involves identifying and manipulating small strings of amino acids that can mimic the molecular signature of an antigenic epitope. Epitopes represent unique

sites on the surface of antigens that the immune system recognizes as a signature of foreign material and develops antibodies to bind to and neutralize the invading pathogen. Developing a peptide mimic of the antigenic epitope thus involves identifying peptides that will specifically bind to antibodies developed against any given threat agent.

Importantly, the peptide mimic does not even need to have the exact same amino acid sequence as the natural antigenic—it only needs to possess certain inherent structural properties (e.g., shape, charge distribution) that are required for optimal recognition and binding between each antibody-epitope pair. While peptide mimics of antigen epitopes are being widely investigated in vaccine research to stimulate the immune system into developing antibodies against the native antigen, by screening for peptides which do not replicate antigen epitopes with high fidelity, the research seeks to mitigate any significant immunological response and thereby increase the safety margin for human exposure to the artificial simulants in open field test conditions.

“Currently, there is no method for performing positive controls in field detection tests,” said Thompson. “Technicians would have to use the actual live agent, which isn’t feasible for fielded systems due to the imposing logistics and human health concerns. Using peptide-based simulants where the peptide substitutes for the native agent would allow positive controls to be incorporated into antibody-based fielded detection systems for the first time.”

The technology would also increase the range of available simulants, allowing scientists to develop a simulant tailored for each threat agent rather than using a generic biological substrate that resembles multiple agents ‘on average’. “It allows us to be specific rather than general,” said Thompson. “Once the process is perfected, we could have simulants readily available to allow researchers to develop and test detection and diagnostic for exotic diseases like the Ebola virus on the open laboratory benchtop without requiring level 4 biosafety containment.”

The peptides, once developed, will need to be attached to a core material that will carry the synthetic epitopes in a way that is physically similar to the native antigen. “The biophysical properties of the simulant core must be close to the biophysical properties of the actual particles,” said Thompson. Several detection devices sort biological particles purely by size, so mimicking the right size and shape is essential for capturing a broad spectrum of simulant use in the RDT&E community. There are a number of synthetic materials that are being investigated. One such core support platform is dendrimers. Dendrimers are extensively branched polymers whose final size is determined by how many generations of successive polymerization reactions are performed. They are ideal for replicating the size distributions of protein toxins and viruses, they’re commercially available and their surface chemistry is readily compatible with attaching peptides to the outer surface.

The technical objectives for this project are to identify peptides that will bind to antigen-defined antibodies, validate the specifics of this bonding and how closely they match the natural antigen-antibody interactions, conjugate promising peptides to the inert core material without losing their molecular binding specificity and test antibody recognition and binding of peptide-based simulants versus actual threat agents. Thompson and his team have made significant advancements on the first three and expect to have completed testing of the first generation of a peptide-based simulant by the end of FY03.

The “Combinatorial Peptides as Epitope Mimics” project at ECBC could bear some very important results. If successful, the synthetic simulants could relieve the nation’s CB defense labs of the logistic and technical biomass requirements tied to natural simulants, provide rugged, environmentally inert simulants that can be readily produced under strict QA/QC guidelines and provide a viable and safe method for incorporating positive controls in calibration and testing of fielded detection equipment.

# AGENT SIMULANT KNOWLEDGEBASE (ASK) CORRALS INFORMATION FOR CB DEFENSE COMMUNITY

By Ray Jablonski and Tim Lavery



In the realm of chemical and biological (CB) defense research, managing the sheer quantity of data—including the data you have and the data you don't have but need—is almost as daunting as the work itself. The Chemical Biological Agent Simulant Knowledgebase (ASK), a Joint Services project managed and maintained by ECBC, is helping corral this wealth of information into a user-friendly, accessible medium for the benefit of the entire chemical-biological defense community. The Knowledgebase provides not only a platform for obtaining standard data values and for calculating, evaluating and analyzing data, but also supports identifying CB data gaps not resolved or filled by current information.

The United States chemical and biological defense community requires accurate, verifiable information about CB agents and simulants in order to efficiently conduct research and development activities. Over the years, several different databases of agent properties, simulant properties, and environmental fates of agents were built and maintained at Edgewood and used by various ECBC researchers in their projects. In 1995, however, funding for the project was discontinued and work stopped. According to Mr. William Ashman, ECBC, three different proposals for revitalizing the database efforts came out in 2001 — and the services took notice.

“The Joint Services saw three separate proposals,” said Ashman. “They told us to put it all together in one package consolidating all the data in a systematic way, and that’s what we’re supporting.”

The knowledgebase is described as a modular information repository system that will contain modules specific to physical and chemical properties, toxicology, simulant applications (or usage), environmental fate and effects, environmental assessment, agent degradation and by-products, spectral data for detection applications, and information on incapacitation and toxic industrial chemicals/materials. One of the features of ASK's graphical interface allows for the ranking by relevance of candidate simulants based upon their chemical or physical properties of interest. Immediate agent versus simulant comparisons can be obtained. Other features will include a spectral and toxicological data graphical viewer and a physical property calculator.

“We’re still building the database,” said Ashman. “If the data sets are not in there already, we’re looking for it or developing it.”

According to Ray Jablonski, the co-principal investigator with Ashman on the ASK project, the database is very useful for both laboratory and operational tasks. The information compiled within the ASK can be used in any CB situation, from hazard response to instrument development and calibration. Only a minimum number of copies of ASK have been distributed so far while the database undergoes a thorough security review to validate the information, which was culled from a wide variety of sources. Jablonski is ushering the unique user interface software through the patent process as well. Once the review and patent processes are complete, future iterations of the ASK modules might include on-line access to ASK via a password-protected website and a stand-alone CD-ROM—allowing true portability for use in the lab or in the field.

Despite the fact that wide release is still pending, the ASK has proven to be a vital resource on many occasions. For example, during ECBC's work with the National Institute for Occupational Safety and Health (NIOSH) to develop standards for commercial self-contained breathing apparatus (SCBA) equipment, ASK was utilized to identify candidate

ECBC Agent/Simulant Knowledgebase Data Retrieval & Analysis Module

File Options Help

Match: ASK V2.5 Complete Master Final Phys- Tox Data: Version 2.5Beta, May 2, 2003

Search Results: Match: ASK V2.5 Complete Master Final Phys- Tox Data: Version 2.5Beta, May 2, 2003

All Results Individual Relevance

TEP

Select Fields: Highlighted fields will be selected

Identifiers

- ASK Code May 2, 2003
- ASK Name, Molname, Chemical Name, Synonym, Abbreviation
- CAS Registry Number
- Chemical Formula
- Description
- Structure Composition
- WLN (Wiswesser Line-Notation)

Physico-Chemical Properties

- Density / Vapor
- Boiling Point Temp (C degrees) (mmHg)
- Diffusion Coefficient: Vapor Diffusivity (cm<sup>2</sup>/s)
- Energy of Vaporization (cal/g)
- Latent Heat of Vaporization at Boiling Point (cal/g) or (kcal/g)
- Liquid Density (g/cc=g/ml)
- Liquid Density Coefficients for Equation (p = a-bT) = Celsius
- Melting Point / (Freezing Point) Temp (C degrees)
- Molecular Weight (g/mole)
- Specific Gravity of Liquid: (water = 1 g/ml) = 1 g/cc (Unitless)
- Vapor Density (AIR=1), (Unitless), ratio (pvapor/pair), Cor
- Vapor Pressure (mm Hg) (Torr)
- Vapor Pressure Equation: Valid Temperature Range
- Vapor Pressure: Antoine Coefficient A
- Vapor Pressure: Antoine Coefficient B
- Vapor Pressure: Antoine Coefficient C
- Volatility (mg/m<sup>3</sup>)
- Solubility / Permeation

View Structure/Image

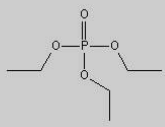
Field Name	Value
ASK Code	May 2, 2003
ASK Name, Molname, Chemical Name, Synonym, Abbreviations and Common Names	TEP, Triethyl phosphate; Phosphoric acid triethyl ester; Ethyl phosphate; (C <sub>2</sub> H <sub>5</sub> O) <sub>3</sub> P; Ethyl phosphate ((EtO) <sub>3</sub> PO); Tris(ethyl) phosphate; Triethylfosfat
CAS Registry Number	000078-40-0
Auto Ignition Temperature (C degrees)	452 (Eastman)
Boiling Point Temp (C degrees) (mmHg)	215-216C(760); 216 (760 with decomp); 209
Chemical Formula	C <sub>6</sub> H <sub>15</sub> O <sub>4</sub> P
Chemical Reactivity	reacts vigorously with oxidizers
Critical Pressure (ATM)	45.41 ATM
Critical Temperature (C degrees)	476.8; 460.5 (appx)
Daytime Biological Decay Rate (%/min), Conversion factor: (1/sec = -ln(1-(%/min))/60 sec);%/sec	0
Description	Colorless liquid with mild odor
Diffusion Coefficient: Vapor Diffusivity (cm <sup>2</sup> /s)	0.05 (0C, calc); 0.053 (20C, calc); 0.055 (25C, calc); 0.059(40C, calc)
Dipole Moment Value (debyes)	3 (25C in bz); 3.08 (25C in bz); 3.07 (20C)
Dissemination Efficiency Chemical (%)	60
Droplet Spread Factor	3.5
Energy of Vaporization (cal/g)	196.5 (0C); 184.5 (20C); 181.5 (25C); 172.5 (40C)
Flash Point C (Degrees)	115.5C, 240F; 115 (closed cup with 40% decomp); 116 (closed cup)
Heat Capacity Value (cal/degree C)	0.594 (55C)
Heat of Formation (cal/g)	-284.74 (25C, vap, est); -298.24 (25C, liq, est); -301.38 (25C, sol, est)
Hildebrandt Solubility Value (H)	8
Latent Heat of Vaporization at Boiling Point (cal/g) or (kcal/mole)	63.41 ; 66.86 ; 66.6 (25C); 75.21 (215C); 2.79e9 cm <sup>2</sup> /s
VLSTRACK Conversion factor: ((cm <sup>2</sup> /s <sup>2</sup> ) = cal/g x 4.18e7)	
LC150 (resp) mg-min/m <sup>3</sup> ; Median lethal dosage (mg-min/m <sup>3</sup> ): median Effective Dosage (mg/70Kg man): This data field is a catch all data field and has various toxicity values in it.	100
Liquid Density (g/cc=g/ml)	1.0943 (0C); 1.0695 (20C)
Liquid Density Coefficients for Equation (p = a-bT) = Celsius (g/ml = g/cc)	1.09430, 0012
Liquid Viscosity (Centipoise (cP)); Poise = n/cm-s = cP(100)-1	2.52 (0C); 1.48 (20C); 1.1

The above results were obtained from the following search criteria:

Field Name	Value
Boiling Point Temp (C degrees) (mmHg)	209C
Molecular Weight (g/mole)	182.16

Structure/Image

TEP Structure/Image



Close

simulants that could function in place of actual agent in pre-qualification tests for the equipment. The ASK provided these alternatives and provided an avenue for cost savings for the manufacturers.

“Each mask and filter needed to be tested with actual agent to meet NIOSH requirements,” said Ashman. “This is a fairly expensive undertaking. The simulants identified by ASK aided in providing a less-expensive pre-test alternative for equipment manufacturers so they could see how their products would fare against agents.” ASK maximizes resources by capturing results of previous work for future reference—preventing any reinvention of the wheel where simulant and agent fate data is concerned. Additionally, the process described by Jablonski and Ashman for how the database was redeveloped in 2001 is a fair example of best practices for tailoring a product to customer needs.

“We needed ASK to be user friendly, easily searchable, and readily accessible,” said Ashman. “We sent a questionnaire to the known CB user community to find out what was needed in a useful database, what options and capabilities people wanted. We called upon our programmer Mark Harrah to design a user interface that reflected those needs.”

The ASK team promoted the database through conference attendance, mailings and flyers. Now that the initial development of the ASK system has been ongoing for nearly two years, word of mouth is becoming a powerful force in making the ASK database known throughout the user community. Interested parties within the DoD, other government agencies and qualified contractors can access the database on a case-by-case basis by contacting the creators of the database directly. This application process is currently being transitioned to the Chemical Biological Information Analysis Center (CBIAC), which should streamline the request fulfillment process.

# BIOSENSORS TEAM—APPLYING TOMORROW'S SOLUTIONS TO TODAY'S BIODETECTION NEEDS

By Debbie Menking

## OVERVIEW

The Biosensors Team is the Edgewood Chemical and Biological Center's focal point for support of military point detection and identification requirements. Biosensors Team's core mission areas concentrate on applying tomorrow's solutions to today's biodetection needs by conducting research, development, testing, and evaluation of commercial, developmental, and emerging immunochemical and nucleic acid-based biosensors. Biosensors Team develops, modifies, simplifies, and transitions immunochemical and nucleic acid-based assay chemistries for use on fielded, commercial, developmental, and emerging biosensors, as well as, develops sample preparation and processing methods for nucleic acid and immunological sample analysis. The Team employs a "total package" synergistic approach to integrate their sample processing, assay development, and point biosensor expertise. The basic and applied research methodologies investigated and employed produce the most optimal bioagent detection and identification by the complementary union of the above elements. Biosensors Team's goal-oriented approach culminates in the development of fielded biosensors, assays, and sample preparation approaches that are rapid, reliable, reproducible, sensitive, durable, and user-friendly. To this end, examples of the Team's focus are:

- The development and assessment of immunological and DNA/RNA sample preparation techniques that can be automated for field use.
- The development and assessment of semi-automated/automated immunochemical and DNA/RNA-based biosensors with improved and optimized assay chemistry methodologies (to include new and novel assay chemistry approaches).
- The assessment and operational testing of these devices and procedures under laboratory and field conditions.

## PRODUCTS/SERVICES

The Biosensors Team has distinguished itself in its ongoing support of various DoD Biodefense Programs. The Team's business focus is widespread. Examples of work include: biosensor/assay assessments, assay conformance testing and validation studies, customer training, assay optimization and development, reagent development and production, technology transfer actions, sample processing assessments and evaluations, hardware development, process automation, and sample analysis.

The Team currently has or has had projects with the following customers: the Defense Advanced Research Projects Agency, the Program Executive Office for Chemical and Biological Defense, the Armed Forces Institute of Pathology, the U.S. Army Medical Research Institute of Infectious Diseases, the Centers for Disease Control and Prevention, USDA, EPA, U.S. Army Dugway Proving Ground, and Special Project Clients. The Team also conducts sample analysis in support of post-September 11, 2001 requirements.

## FACILITIES AND CAPITAL EQUIPMENT

The Biosensors Team facilities incorporate 18 laboratories dedicated to its core missions and customer areas, and are rated up to Biosafety Level II. In addition, a number of specialized systems are on hand. The immunological laboratories are equipped for rapid antibody-based analysis. Instrumentation includes: the IGEN ORIGEN® electrochemiluminometer, the MSD Sector PR™ Multi-array™ electrochemiluminometer, the Perkin Elmer VICTOR™ time resolved fluorometer, the Luminex 100™ System, and the Molecular Devices Threshold™ light addressable potentiometer. The molecular laboratories are equipped for a variety of nucleic acid analysis and detection platforms to include a large number of real-time approaches. Some of the technologies are: the Idaho Technology Light Cyclor 32™ and RAPID™, the

Cepheid Smart Cycler™ and Biological Sample Preparation System, the Microfluidics Systems Inc. Automated Genetic Identifier prototype, the Smiths Industries BioSeeq, the Applied Biosystems HT7900, the BioRad I-Cycler, and an Affymetrix microarray system. Rapid, simple, and sensitive bio-agent assays for most of the above technologies have been developed and transitioned to end-users in the biocommunity. The team also has full microbiological, microscopy, chromatography, and small-scale production lyophilization capabilities.

Biosensors Team has distinguished itself over the years in its development and evaluation of biosensor, assay, and sample processing technologies in support of the DoD Biodefense Programs as well as other government agency requirements. The Team is recognized both in the US and internationally for its expertise in the biodetection and support technology areas. It will continue to advance its expertise and capabilities to better serve its customers and by direct extension—the national interests.

## ECBC'S MOBILE LABORATORY EXPERTISE SUPPORTS MANY VENUES

By Monica Heyl

Within the Edgewood CB Center there is a sophisticated and unique team of scientists, engineers and support staff that comprises the Mobile Labs and Kits Team. This team has over a decade of experience in meeting and exceeding external customer requirements and Army interests in the development of mobile CB analysis systems.

The Mobile Labs and Kits Team is a component of the Edgewood Chemical Biological Forensic Analytical Center (EC/B FAC). The EC/B FAC is ECBC's fixed-site laboratory, which houses a wealth of analytical equipment that is available to support our mobile laboratories.

Over the past year the Mobile Labs and Kits Team has been extremely busy meeting the needs of a myriad of customers. Following is a listing of some of those customers and the work that the team is doing for them.

### FOOD AND DRUG ADMINISTRATION (FDA)

Through an Interagency Agreement (IAA) signed in late 2002, the Food and Drug Administration (FDA) and ECBC have partnered to find solutions to the challenges posed by the ever-increasing imports and the threat of terrorism. In a news release following the agreement signing, Dr. Lester M. Crawford, FDA Deputy Commissioner, stated, "These mobile labs will provide our experts with the mobility they need to effectively protect the public health

under exceptionally demanding circumstances." Under the Scope of Work with the FDA, the ML&K Team is building a mobile laboratory system with chemical and microbiological analytical capabilities. The FDA's intent is two-fold: first, to be able to increase their presence at ports of entry to our country. Secondly, and as importantly, these same mobile laboratories will be capable of responding to a potential terrorist incident in the contiguous United States. This solution provides an extremely effective way to execute FDA WMD dollars for WMD preparedness while increasing the FDA's everyday activities at entry ports to our country. The FDA Laboratories will be transitioned in 1st Quarter FY04.

### FEDERAL BUREAU OF INVESTIGATION (FBI)

In 1997, ECBC was sought after by the FBI's Hazardous Materials Response Unit (HMRU) to develop a comprehensive, transportable laboratory that addressed field requirements for the analysis of materials of chemical, biological, and high explosive residue origin. Since that time, two field laboratory systems transitioned to the FBI; and through a Memorandum of Agreement, these systems were deployed to the 2002 Winter Olympics in Salt Lake City, directly supporting the missions of the FBI's Hazardous Material Response Unit (HMRU) and the FBI's Explosives Unit. One of these systems was used in Saudi Arabia. The mobile laboratory capabilities are essential to

the operations of the FBI. FBI Director, Robert Muller, visibly recognized the impact of these capabilities by having the systems on display and by specifically mentioning their importance at the opening of the new FBI Laboratory in 2003. These systems are detailed below.

(1) The EC/B FAC developed a comprehensive, transportable laboratory that addressed field requirements for the analysis of materials of chemical, biological, and high explosive residue, named the "Fly Away Laboratory," for the FBI's Hazardous Material Response Unit (HMRU). This variant of the modular laboratory can analyze a broad spectrum of WMD materials, expanding the existing capability from chemical warfare materials to biological and mid-spectrum materials. The \$2.5 million product is an integrated series of interconnected modules that once assembled, provides field forensic information. It is easily transportable by air, land and sea.

(2) As a direct result of the laboratory development for the FBI's HMRU, the EC/B FAC was funded to develop a three-tiered explosives detection capability named the "Explosives Laboratory System" for the Explosives Unit within the FBI's Laboratory Division. Phase 1 of this system was used on September 11th, 2001, responding to terrorist attacks at both the Pentagon and the United Airlines' crash site in Somerset, PA.

(3) The EC/B FAC recently received funding from the Explosives Unit within the FBI's Laboratory Division to perform the following four tasks over the next 18 months:

- Enhance existing EXLAB resources by standardizing all components.
- Procure additional EXLAB resources to improve analytical capabilities
- Train Explosives Unit personnel in the use of all EXLAB components
- Support EXLAB missions either directly through deployment of EC/B FAC personnel or indirectly through technical consultation.

## JOINT SERVICES INSTALLATION PILOT PROJECT (JSIPP)

The EC/B FAC is designing and fabricating mobile analytical laboratories for the Joint Program Executive Office for Chemical Biological Defense (JPEO CB) in support of the JSIPP. The JSIPP is managed by the Defense Threat Reduction Agency (DRTRA) and is a pilot project designed to enhance emergency response capabilities for chemical, biological, radiological, nuclear and high explosive (CBRNE) events on military installations. Through this partnership with the EC/B FAC, the JPEO CB plans to have six high-throughput labs strategically placed before the end of 2003. The first mobile laboratory, which is a 60-ft trailer, was positioned on location at the Marine Corps Base Camp Lejeune the week of 25 August.

*Members of the EC/B FAC won the 2003 Federal Laboratory Consortium (FLC) Excellence in Technology Transfer Award. These individuals have spent years exceeding technology transfer objectives for the U.S. Government. They hold four U.S. Letters patents, two exclusive license agreements; have facilitated several CRADAs; and have written numerous MOAs/MOUs, IAAs, and DEAs. The benefits associated with these products not only support public (state and local) first responders, military leaders, and lead Federal agencies in responding to chemical, biological, and radiological terrorism worldwide, but the compilation of technologies integrated directly increases public safety, supporting Federal and local first responders; providing protection of industrial trade secrets; and enhances law enforcement efforts to protect our country against terrorism and the threat of weapons of mass destruction.*

# BRIEFS



**NATIONAL PARK SERVICE.** Our Weapons of Mass Destruction Installation Protection (WMD IP) representatives met with the National Park Service (NPS) in April regarding Responder Awareness and Operations training for National Park Service field offices across the country. The WMD IP team was originally going to provide on-site training at the Park Service's studio in Harper's Ferry, WV. However, due to urgency, the NPS did not want to delay delivery of the training. As an alternative, the WMD IP team offered videotaped versions of the Awareness and Operations courses. An Interagency Agreement with the NPS has been initiated in case the NPS requires additional assistance from our Homeland Defense Business Unit.

**ECBC'S CHEMICAL BIOLOGICAL FORENSIC ANALYTICAL CENTER TO BUILD JOINT SERVICE'S INSTALLATION PILOT PROGRAM MOBILE LABS.** The Forensic Analytical Center's Mobile Labs and Kits (ML&K) Team has been tasked and funded to develop six semi-mobile prototype laboratories to support the Joint Services Installation Pilot Project (JSIPP). The ML&K Team and representatives from several vendors met in April to discuss design criteria and to delineate the responsibilities of the parties involved. Representatives from ECBC's CB Services Directorate joined the group, offering their expertise in risk assessment and safety issues to the development process.

**EVALUATION OF CHEM/BIO GLOVES.** ECBC was tasked by the Army Test and Evaluation Command to provide assistance in evaluating data for the JB1GU glove. Those involved in the evaluation were members of ECBC's Applied Toxicology Team, the Modeling Simulation and Analysis Team, and the Passive Stand-Off Detection Team. Participants attended the briefing to the MARCORSYSCOM Commander in April. The Commander was quite pleased with the package that was given to him before the briefing, and he signed off on the item—without a formal briefing.

**ANALYTICAL LABORATORY SYSTEM (ALS) CAPABILITIES IMPROVEMENT PROGRAM.** ECBC's Biosensors Team is currently assisting the PM WMD in their program to improve the current capabilities of the mobile ALS. This collaborative effort includes members of the PM WMD office, ECBC (including elements of chemical and biological detection), Battelle, and user groups. Initial efforts focused on the development of Marketing and Survey tools to identify and rate new/updated technologies that will improve and enhance the user group's capabilities in chemical and biological agent detection while maintaining the customer's mobility. A survey model was developed that categorized new technologies based on a variety of characteristics that included sensor sensitivity, specificity, analysis time, sensor logistics/operation, and human factors. This Marketing and Survey model was finalized and each of the categories were weighted/prioritized by the members of the user group in a meeting that included representatives from the PM WMD, ECBC, and Battelle. Subject Matter Experts (SME) will use this weighted decision tool to rate the new technologies.

**VISIT TO PRINCETON UNIVERSITY TO DISCUSS DIELECTRIC SPECTROSCOPY.** A member of ECBC's Biosensors Team visited a professor of the Department of Physics at Princeton University in April to discuss her progress using dielectric spectroscopic techniques for biodetection. Also in attendance was the DARPA Program Manager for BioFlips, under whose auspices the professor is performing the work. DARPA has funded the Biosensors Team to test promising technologies within his program as they reach an appropriate level of maturity in order to investigate and assess, as early as possible, the basic approaches and methods being developed, as well as their biodetection potential. A number of micro fluidic-based dielectric spectroscopy methods have been developed for the detection, and in some cases, identification of bioagents. One method that is near to being ready for the Biosensors Team testing is able to discriminate among different bacteria. Another, that is immediately available, is an immunoassay device that measures antibody-antigen binding and can discern differences between various immunocomplexes. A third, which has a long way to go, is a dielectric chip that can discriminate between nucleic acid amplicons. The Biosensors Team tested the limits of the first two starting in the early summer.

**QUADRUPLEX TAQMAN®-PCR ASSAY FOR REAL-TIME AND SIMULTANEOUS IDENTIFICATION OF BACILLUS ANTHRACIS, YERSINIA PESTIS, AND FRANCISELLA TULARENSIS.** ECBC's Biosensors Team is successful in showing the proof-of-principle of a first ever Quadruplex TaqMan®-Polymerase Chain Reaction (PCR) assay for rapid, real-time, and simultaneous identification of multiple Biological Warfare (BW) agents on the Smart Cycler®. The assay targets four genes in one assay reaction, namely, the lethal factor (lef) and the capsular antigen A (cap A) genes of Bacillus anthracis, the pesticin (pst) gene of Yersinia pestis, and the 17kDa major membrane protein (TUL4) gene of Francisella tularensis. Recently, the team has also developed and optimized two more duplex TaqMan®-PCR assays for simultaneous identification of Vaccinia virus and Yersinia pestis, and Francisella tularensis and Vaccinia virus targeting one gene each from two respective BW agents. The multiplex assays will expedite and confirm the analysis of a limited volume unknown sample by interrogating more than one gene target per agent and/or more than one agent in a single TaqMan®-PCR reaction. The efforts are underway to optimize the assay conditions for the quadruplex TaqMan® assay. The multiplex assays are being developed under the DTO-CB 20 funded Auto Genetic Identifier (AGI) project.

**COORDINATION OF SERDP-FUNDED CL-20 RESEARCH.** A member of ECBC's Environmental Toxicology Team recently briefed the Science Advisory Board (SAB) of the Strategic Environmental Research and Development Program (SERDP) regarding coordination of SERDP-funded research among U.S. Army ECBC, the Battelle Pacific Northwest National Laboratory, and the Biotechnology Research Institute-NRC Canada. Research teams at these agencies are collaborating in their investigations on different aspects of the environmental fate and effects of the new energetic material CL-20. The SAB praised both the high quality of the research and the coordination efforts among the research teams.

**HIGH THROUGHPUT IMMUNOASSAY TECHNOLOGY EVALUATION.** ECBC's Biosensors Team has signed a Letter of Agreement with the firm Meso Scale Discovery to evaluate the Sector PR, a multi-array based technology. The Sector PR reader is compact in size (no larger than a shoebox) and reads a standard 96-well microtiter plate in less than two minutes with the unmatched sensitivity and flexibility of electrochemiluminescence. This technology is part of a basis for development of high throughput immunoassays for screening of environmental samples. In the hands of the Biosensors Team, the Sector PR assay has the potential of becoming one of the most rapid and sensitive high throughput immunoassay screening devices to-date.

**SAMPLE PROCESSING AND DETECTION COLLABORATION.** ECBC's Biosensors Team presented its findings in an interim project review at the National Institute of Standards and Technology (NIST) on our analysis and validation of a protocol developed for large volume environmental samples to our collaborators at NIST and to the clients; the presentation was well received. The audience included the Chief of the client's Assessments Section - Biotechnology Division and the Chief of NIST's Biotechnology Division. Work will continue on focusing the collaboration into one unified protocol for processing the client's unique large volume environmental samples and to provide the user optimized test platforms for both immunochemical and molecular detection capabilities.

**STATE-OF-THE-ART COMPUTATIONAL FLUID DYNAMICS MODELLING CAPABILITY.** In May, a member of ECBC's Smoke and Target Defeat Team was invited to present a colloquium on the development and application of Computational Fluid Dynamic (CFD) modeling capability. Results from numerous ECBC projects, which have benefited from CFD simulations were highlighted. These projects include Agent Fate Laboratory Studies, Aerosol Collector Technology and the Technology Integration Office, and the Engineering Directorate. CFD codes at ECBC are now capable of simulating a wide variety of physical phenomena such as: subsonic to supersonic internal and external flow fields, heat transfer, multi-phase (solids, liquids, and gases), multi-species, chemical reactions, steady state and transient environments, forces and moments due to air flow, mechanical movement (mixers) and aerosol particle tracking.

**ECBC PRESENTATION TO HOMELAND DEFENSE CHEM-BIO UMBRELLA (HDCBU) RADAR PROGRAM REVIEW.** A presentation entitled "Radar Backscattering for BG and Kaolin Dust" by Avishai Ben-David, David Anderson, James Shomo, Paul DeLuca, and Alan Samuels was given in April at ECBC. The presentation included new spectral refractive index (dielectric function) for BG and kaolin dust at radar frequencies (2 GHz to 14 GHz). This information is the basic science, which is needed for assessing the potential of radars to measure BG. The expected spectral radar backscattering cross-section (e.g., radar reflectivity) as a function of particle size distribution was shown and discussed. The presentation shows the extreme sensitivity (orders of magnitude) of the radar reflectivity to the size distribution and the presence of large (tens of microns) particles.

**MODULAR EMERGENCY MEDICAL SYSTEM.** The American Medical Association's (AMA) Center for Disaster Preparedness and Emergency Response (CDPER) has indicated an interest in the Military Improved Response Program's Modular Emergency Medical System (MEMS). The MEMS is a mass casualty care strategy for biological terrorism incidents. Members of the CDPER have indicated that observations from the Severe Acute Respiratory Syndrome (SARS) epidemic suggest that closing hospitals and adopting a strategy such as the MEMS may be an effective way to control the communicable disease while preserving the infrastructure of the existing healthcare system.

**VISIT WITH SENATE STAFFERS.** Members of ECBC's Research and Technology Directorate and CB Services Directorate briefed Mike Hadley (Senator Mikulski's defense staffer) and Jim Wood (Senator Sarbanes' Legislative assistant) on the various ECBC bio initiatives, including the glove box for the BSL-3 lab. The visit went well and the Senate staffers raised no concerns about any of the initiatives. They were especially impressed with our security/surety/safety measures, the potential for the cGMP capability to help the state's biotechnology companies, and the fact that the Army would go out of its way to keep them apprised of what it's doing. At the end of the meeting, the Senate staffers were invited to come to ECBC to tour some of our facilities. They also mentioned that at some point in time they may come to us for evaluation of CB detection equipment since they have been swamped with people trying to sell their particular technologies/applications. We suggested they use ECBC as their technical support during the next fiscal cycle and they responded favorably. They closed by asking what they could do to further support our mission.

**"DENIED AIR" JOINT SERVICE ADVANCED CONCEPT TECHNOLOGY DEMONSTRATION (ACTD) PROPOSAL.** In July we participated in the Denied Air Joint Service ACTD Working Group Meeting. The meeting was held at the facilities of Boeing Corporation, Long Beach, CA. Planned as a potential FY05 start, the ACTD proposes to demonstrate affordable and effective Chemical-Biological Protection Systems (Filtration and Detection) for military transports. The demonstration test bed will be the USAF C-17 Globemaster III. ECBC will collaborate with Boeing to integrate the XM50 NBC filter (designed for integration into the V-22 Osprey aircraft) into this platform. This effort will include air vehicle engineering design and modification, hardware installation, system architecture design, and ground/flight testing. Follow-on meetings are scheduled to develop a detailed cost estimate for the ACTD proposal.

**STEPO CHEMICAL PROTECTIVE SUITS.** A Self-Contained Toxic Environmental Protective Outfit (STEPO) suit was sent to Cape Canaveral Air Station (CCAS) to allow NASA engineers and NASA contractors' time to become familiar with the features of the suit. Two ECBC engineers traveled to CCAS to participate in suit technology discussions. The CCAS is undergoing an exercise to determine the best plan to replace/upgrade their existing chemical protective suits. Technicians at CCAS donned/doffed the STEPO suit and were given an information briefing on the suit. Further contacts will be made to determine the feasibility of NASA purchasing STEPO ensemble for fuel loading operations.

**SEQUENCING OF ANTHRAX PROTEIN BIOMARKERS.** A more intensive and confirmatory method was adopted to determine sequence information of specific protein biomarkers for confirming the presence of bacterial pathogens in unknown samples. Multidimensional protein identification technology (Mud PIT), combining on-line high-resolution liquid chromatography and tandem mass spectrometry (MS/MS), was adopted to identify sequences of protein biomarkers for an individual pathogen. Acid and base soluble and membrane fractions of the *Bacillus anthracis* endospore cell lysates were separated and the latter was subjected to cyanogens bromide treatment. Both fractions, separately, were reduced and carboxymethylated, followed by digestion with Lys-C and trypsin. A very complex mixture of peptides, generated as a result from the cell lysates, was loaded over a C18 and strong cation exchange biphasic micro-capillary column and fractionated. Each of the fractions was further separated on-line over a C18 column and introduced directly into a nanospray ionization source and analyzed in an ion trap tandem mass spectrometer. The MS/MS spectra generated as a result, containing the fragmentation patterns specific to amino acid sequences of the peptides, were subjected to anthrax protein database search using SEQUEST algorithm. During our preliminary investigations, Mud PIT approach has been successfully applied for identifying over 500 proteins (<249 kDa) expressed in two pathogenic *B. anthracis* strains (Ames and Vollum). Identification of more expressed proteins and phosphorylated sites in these proteins are also being presently pursued in collaboration with Scripps Research Institute at La Jolla, CA.

**TOXICOLOGY VALIDATION.** ECBC's Molecular Engineering Team (MET) has been conducting a toxicology validation study for the National Institutes of Environmental Health Sciences (NIEHS). This study, which includes protocol development, uses two different cell lines to assess the toxicity of a broad range of toxic industrial chemicals (TICs) and materials (TIMs). This in vitro approach is intended to partially replace animal use with cell cultures for future toxicology assessments of TICs and TIMs. The MET has successfully completed the Phase I (Ia and Ib) study under GLP (Good Laboratory Practice) - compliance. All data and the final phase Ia report were delivered to, and accepted by, the NIEHS. The second phase study has been approved, funded, and initiated. The sponsor presented the phase I study at the SOT, SIVB and EUROTOX meetings in 2003.

**URBAN AIRBORNE CHEMICAL DETECTION EXPERIMENTS.** ECBC recently participated in the DTRA-sponsored Joint Urban Trials in Oklahoma City, OK with the Airborne Chemical Imaging System (ACIS). The purpose of the study was to advance knowledge about movement of contaminants in an urban environment. This was a highly controlled study involving over twenty principal investigators. Helicopter-based ACIS platform was flown during four of the release periods. The ACIS contains two passive infrared (IR) standoff chemical sensors: a high-speed Fourier Transform spectrometer (the TurboFT) and a tunable Fabry-Perot IR spectroradiometer (the AIRIS). We were able to obtain several high-quality imaging data sets with the AIRIS that demonstrated substantial vertical drafting of the vapor around buildings downwind of the release point. The more sensitive TurboFT was used to measure trace amounts of the vapor in the urban canyons much further downwind of the release point.

**MEETING OF SWGFACT.** Dr. Dennis Reutter, Stephen Lawhorne and Mary Drummond from the C/B FAC attended a meeting of the Scientific Working Group on Forensic Analysis of Chemical Terrorism in August at the FBI Academy, Quantico VA. The meeting was to hear reports from Dana Tulis, EPA ORD, regarding EPA efforts, issues, and proposals for forming a chemical laboratory response network and from Phil Edelman, HHS, who reported Homeland Security Council mission, efforts, proposals and his proposals for interagency cooperation. Dr. Dennis Reutter contributed to discussion on Department of Homeland Security efforts and coordination. Also reporting was Dr. James Pearson who is the Director of the Virginia Public Health Laboratories and the appointed representative for State members of the Laboratory Response Network. Two sub-committees met during session. The committee on infrastructure drafted a series of recommendations to be presented to DHS and the Commission on Homeland Security regarding infrastructure deficiencies and possible remedies while the Sub-committee on methods drafted a publication on Guidelines for Quality Assurance for Forensic Analysis of Chemical Terrorism Samples. It is expected that the guidelines document will be published in the journal NATURE.

**CONTAMINATION AVOIDANCE AT SEAPORTS OF DEBARKATION (CASPOD) ADVANCED CONCEPT TECHNOLOGY DEMONSTRATION (ACTD) PRELIMINARY DEMONSTRATION (PD).** The CASPOD ACTD PD was held from 22 August thru 9 September 2003 at Charleston Naval Warfare Center, Charleston, SC. The PD exercised the down-selected technologies, as well as concepts of operations in an operationally realistic port scenario using military operators. Members of the 95th Chemical Company from Alaska as well as the 143rd Transportation Group and the 348th Transportation Battalion participated as military operators. Over 35 technologies in CB detection, decontamination, collective/individual protection, medical, and information management were evaluated at the PD. Technology training and use will be overseen by members of the Technology IPT, which is chaired by the Research & Technology Directorate at ECBC.

# CONVERTING M49 GENERAL AVIATOR PROTECTIVE MASKS TO M48 APACHE AVIATOR MASKS SAVES THE TAXPAYERS MONEY

By Lowry Brooks and LTC Robert Walk

They said it couldn't be done. Conversion of an M49 facepiece to an M48 facepiece without destroying the mask was impossible, they said. They were wrong. Pine Bluff Arsenal (PBA) employees are today converting M49 facepieces to M48 facepieces and saving the American Taxpayer money. Why was it needed? This article will give the story behind the program.

The M48 Apache Aviator mask program was started to convert stored M43A1 Type I Apache Aviator masks into M48 Apache Aviator masks at PBA. At the same time, the M49 program was started to change stored M43A1 Type II General Aviator masks to M49s at PBA. The major difference between the two masks is the right eyelens. The Apache Aviator mask (M43A1 Type I and M48) has a notched right eyelens for use with the AH-64 Apache's signature Integrated Helmet and Display Sighting System (IHADSS). Non-Apache Aviators don't need this and so the lens is rounded in the general aviator mask (M43A1 Type II and M49). Both masks were adopted as standard in 1996. The M45 General Aviation mask was also adopted at about the same time. The M49 mask program stopped shortly thereafter because the M45 mask was significantly less expensive to make. This left a large quantity of M43A1 Type II masks with no foreseeable use by the Army.



*Notched Right Eyelens*



*Interface with AH-64 Apache IHADSS*

In 2001, production of M48 masks for fielding was ready to begin. Unfortunately, the requirement exceeded the number of M43A1 Type I and M48 masks available. Thus, the M48 team's dilemma: where to get additional M48 masks? The original production line for the facepieces had closed in 1994, so restarting the line to make a few masks would be cost-prohibitive. Apache aviator masks are more expensive and more labor intensive to manufacture than other Army protective masks. The only available answer was to convert some M43A1 Type II masks.

Conversion of M43A1 Type II masks to Type I masks was the answer, but there were technological hurdles to overcome. First, the masks were assembled with the eyelenses permanently installed and not meant to be removed without destroying the mask. Second, there were no replacement notched eyelenses available for installation. Third, there was no approved procedure to perform this alteration. Finally, there was little funding available for this project.

Knowing the need, work began to find a method of converting Type II masks to Type I masks. The M48 team recognized a possible avenue for funding this project might come through the Army's Operation and Support Cost Reduction (OSCR) program. The first OSCR proposal was rejected as technologically infeasible. However, the M48 team was determined and through persistence, succeeded

in obtaining funding for the project. Through the OSCAR program, a small grant came to conduct engineering research into finding the best method to remove the Type II right eyelens. The method is meticulous and time consuming, requiring handwork to remove the cross-linked polyurethane adhesive holding the lens in place without damaging the rubber facepiece. The remaining adhesive in the eyelens socket is then carefully cleaned out. The eyelens socket is lightly abraded and an adhesion promoter is applied. The new notched eyelens is then bonded into place from both inside and outside the mask. The modified mask is then cured and checked for leakage. An additional advantage of this process is that it can be used to repair M48 facepieces with scratched eyelenses; a defect which would otherwise classify the mask as unserviceable.

The M48 team conducted trials to determine the best procedure to obtain optimal bonding of the new eyelens to the facepiece. The M48 team worked to define the necessary testing required to prove the eyelens removal and replacement process worked. PBA sent the M48 team several masks marked as unserviceable with scratched eyelenses. The team then replaced the eyelenses in the laboratory at ECBC. A battery of testing followed which included accelerated storage, rough handling and leakage. The mask conversion process passed all the validation tests and was approved for production in 2002.

A producer for the notched right eyelens was found to supply the necessary replacement part. The notched right eyelens for the M48 Mask had not been in production for a decade. The M48 Team worked to make sure the new eyelenses met all of the chemical agent resistance, physical and optical performance requirements of the original lenses. The next question became: "Who will do the work?"

The M48 mask conversion production line was already at PBA. PBA workers volunteered to learn how to convert the Type II mask to a Type I mask without destroying the mask. Four workers were found with the necessary skills and patience to get the job done, although only three are currently doing the work. The M48 Team in conjunction with PBA determined the best way to adapt the eye lens removal and insertion methodology from a laboratory to



*A PBA worker uses a pneumatic adhesive dispenser to bond the new eyelens.*

a production environment. The resulting work package procedures will be adopted into the Depot Maintenance Work Requirements Manual for the M48 Mask.

As you read this article, dedicated PBA employees are converting M43A1 Type II masks to the M48 standard. With the addition of the converted M49 Masks to the M48 Apache masks already on hand, PBA will have sufficient masks available to meet the Army's need for M48 masks for at least the next 10 years. This is a quantum leap in Apache aviator protective mask availability.

What is the savings? Initial cost of the M43A1 Type I mask was \$1800. It costs around \$200 to convert this mask to an M48. A new production contract for M48 masks in 2003 could be as high as \$10,000 a piece due to the small quantity needed. Despite the hand labor involved, M43A1 Type II masks are being converted to the M48 standard for around \$400. If 1000 M43A1 Type II masks were converted to the M48 standard, this represents a savings of a \$1,600,000 at the original M43A1 mask cost or over \$9,600,000 saved at the current expected replacement cost.

They said it couldn't be done, but with a little imagination, a small amount of funding and a positive attitude, it was. The American Taxpayer and Apache Aviator are reaping the result: a world-class protective mask for the Apache Aviator available in sufficient numbers for the first time.

# UPDATES



## NBC DEFENSE EQUIPMENT

### Contamination Avoidance

#### *M31E2 Biological Integrated Detection System (BIDS)*

The M31A1 BIDS serial numbers 47, 50, 52, and 55 have successfully completed system level acceptance testing. The acceptance procedures again identified several component anomalies that were corrected by the manufacturing team and then successfully reevaluated. This formalized step in the manufacture and integration process adds to overall quality of the fielded product. Additional acceptance testing of subsequent units is continuing.

#### *M8 Detector Paper*

ECBC's Surveillance Team conducted surveillance testing of M8 Paper currently held at various Army stockpile sites. The purpose of the testing was to determine stockpile reliability, usability, and material readiness, or limitations of fielded M8 chemical agent detector paper shelf life (age) category. Initial test results indicate the viability of stockpiled M8 detector paper. A decision on shelf life code adjustment is pending.

#### *Joint Point Biological Detection System (JPBDS)*

A study to characterize the flow patterns over the vehicle and trailer mounted versions of the JBPDS was recently completed and a report to PM-JBPDS was submitted. The study was initiated in October 02 due to concerns of proper inlet placement in proximity to camouflage netting and bluff bodies. The study was conducted in an ECBC wind tunnel using scale models and in the ECBC Breeze Tunnel using actual hardware. The results will be useful in alleviating problems of false positives due to interferent ingestion, and also in the configuration of the JBPDS in various situations.

### Individual Protection

#### *M40/M42 Series Mask*

The technical data portion of the Procurement Package Input (PPI) for the noseclip valve seat assembly was recently compiled, reviewed, and certified. The item is relatively new and source controlled, and will be bought for a second time using the completed PPI documents. A meeting was held with the sole source supplier to discuss the drawing requirements and establish quality assurance provisions,

since these are currently missing from the technical data package. The replaceable noseclip valve seat assembly will allow a soldier to replace missing or broken noseclip valve seats in the M40A1/M42A2 Mask.

Surgeon General personnel in the Center for Health Promotion and Preventative Medicine (CHPPM) have indicated that they will be issuing a toxicity clearance on the rubber formulation used for the M40A1 mask internal drink tube. The current water/iodine extraction test requirements in the toxicity portion of the specification have been deemed not relevant to the toxicity of the drinking tube rubber formulation. The CHPPM has found the material to pass all safety standards set by the FDA. This toxicity clearance is the final first article requirement remaining to be resolved and clears the way for first article acceptance and production of urgently required drink tubes.

#### *M41 Protective Assessment Test System (PATS)*

The contractor has resumed production of collimating lenses for the laser particle counting module. Deliveries made to date will allow production to ramp back to 100 units per month in Aug as scheduled.

#### *Joint Service Mask Leakage Tester (JSMLT)*

In August, BG Steven V. Reeves, Joint Program Executive Officer for Chemical and Biological Defense, approved the Low Rate Initial Production (LRIP) of 30 production-representative Joint Service Mask Leakage Tester systems for Production Qualification Test and Multi-Service Operational Test and Evaluation. This successful MS C LRIP decision reflects positively on the hard work of the all involved in this process.

#### *C2A1 Canister*

A contractor proposal was approved for an alternate manufacturing process to attach the top and bottom fines filter disc to the screen disc. The alternate process allows the contractor to use ultrasonic welding in lieu of heat welding to assemble the fines filter assemblies. Since the C2A1 Canister is governed by a performance specification, the contractor was required to submit objective evidence that the manufacturing change did not adversely affect item performance. A test protocol was established concentrating on those performance characteristics (airflow resistance, smoke penetration, dust emissions) that might

be impacted by the change. The canister test results met the performance specification requirements and were very comparable to those achieved by canisters using the current heat welding method.

#### ***M14 Mask Leakage Tester***

An Engineering Change Proposal (ECP) which eliminates the use of mineral oil as a challenge media on the M14 Tester was recommended for approval at the 5 Jun 03 Level II Configuration Control Board. The American Conference of Governmental and Industrial Hygienist (ACGIH) has lowered the threshold limit values for exposure to mineral oil mist to .2mg/cubic meter (from 5mg/cubic meter), since the mineral oil has been found to be a suspected carcinogen when inhaled. Only one challenge media will now be allowed for gas mask leakage test on the M14 Tester. The change resulting from this action will be distributed to all site users of the M14 Testers for immediate incorporation.

#### ***M1 and M1A1 Waterproof Bags***

A Request for Deviation (RFD) for needed M1 and M1A1 bags was approved on 29 May 03. The RFD will allow the contractor to deliver the bags in unit pack boxes that do not meet the weather resistance requirement currently specified on the special packaging instructions (SPI) for the bags. The RFD was approved in part because the government is in backorder and anticipates the bags to be issued to the field upon receipt from the contractor and therefore, the bags affected are not expected to be exposed to long-term storage at Depot. Approval of the action will expedite delivery of bags and alleviate the current backorder situation. Future delivery of both bags is expected to comply with all the contractual packaging requirements.

### **Collective Protection**

#### ***Gas-Particulate Filter Unit Hoses***

In June, ECBC completed an Engineering Change Proposal (ECP) that will clarify the type of rubber material that can be used for the liners and bearings on these hoses. The Defense Logistics Agency (DLA) identified this as a problem after their hose suppliers began using neoprene for the rubber material, which is much less flexible than isoprene and is therefore much harder to make fit with other parts. Use of neoprene had become acceptable by the drawing because changes to the applicable military specifications over time had lessened the restrictions on the type of material that could be used. The revised drawing will specify that only isoprene can be used to make the hose in the future. The ECP was coordinated through DLA who agreed that it would be suitable for resolving the problem.

#### ***M1A1 and M2A2 Air Purifiers***

Engineering Change Proposals have been completed to reinstate two cancelled item specifications. These documents cover the M1A1 and M2A2 Air Purifiers, components of the M13A1 and M8A3 Gas-Particulate Filter Units. Both have been reinstated as detailed specifications with updated Special Packaging Instructions. The Notice of Revisions from the completed actions will be included in upcoming buys for these items, and other buys for assemblies that contain the purifiers as components.

ECBC Rock Island completed a formal engineering change on 6 May 2003 on the centrifugal fan for the M1A1 and M2A2 Air Purifiers. The action changes the fan's specification from a detailed document to a performance document. The MIL-PRF-50084 will now be used to buy the fan in the future. The Notices of Revision from the change will immediately be incorporated into pending buys for the fan and several other items of which the fan is a component. The fan blows 12 to 20 CFM as part of the M8A3 and M13A1 GPFU systems, which are installed in personnel carriers, tanks, and other vehicles.

#### ***M12A1 Gas Filters***

Thirteen M12A2 Gas Filters from Hunter Manufacturing Company's production lot SXE03-C001-010 were evaluated for DMMP Life and Air Flow Resistance in accordance with MIL-PRF-14512L(EA) requirements. All filters passed the production lot acceptance test. This test represented a quantity of 2400 filters.

#### ***M98 Gas Filters***

Nine M98 Gas Filters from Hunter Manufacturing Company's production lot SXE03-D001-001 were evaluated for DMMP Life and Air Flow Resistance IAW MIL-PRF-51527A(EA) requirements. All filters passed the production lot acceptance test. This test represented a quantity of 360 filters.

#### ***M13 Particulate Filters***

Blue Grass Army Depot reported in February that the rubber gaskets were detaching from some new M13 Particulate Filters they had received from Hunter Manufacturing Company. To revise the method of attaching the gasket in their production facility, Hunter eventually decided on a pressure-sensitive adhesive, similar to a design used on the M98 200 CFM Filter with good results to date. Hunter prepared ECPs to change the M13 Particulate Filter TDP, along with the M19 Particulate Filter and M23A1 Gas Filter TDPs. The M19 and M23A1 TDPs were changed since they used rubber gaskets that were attached in much the same way as the one on the M13,

and so had the potential for similar adhesion problems. The ECPs were approved and implementation in Hunter's contracts should prevent any repeat of the adhesion problem in the future on these items.

An SBCCOM Configuration Control Board recommended approval of an Engineering Change Proposal to update the technical data for a frame assembly, PN 5-19-1754. This frame assembly is a component of several installation kits for different GPFUs in numerous vehicles. Demand for this item has increased in the last couple of years, since it is now being installed in Stryker vehicles with other components of the M13A1 GPFU. The update included revisions to the item Special Packaging Instructions and the Quality Assurance Provisions to reflect current requirements for these documents.

#### ***M48A1 Gas Filters***

Six M48A1 Gas Filters from Parmatic's Lot PFCC00J003-044 were evaluated for DMMP Life and Air Flow Resistance in accordance with MIL-PRF-51525A(EA) requirements and screened by Pine Bluff Arsenal. All filters passed the production lot acceptance test. This test represented a quantity of 107 filters.

#### ***M18/M20 Protective Entrance Control Modules***

On 21 May, the TDP Proponent Approval Authority signed a waiver to use military specifications and standards in a solicitation for a control module used in the M18 and M20 Protective Entrances. Approval of the waiver allows the solicitation to move forward and begin the process of finding potential suppliers. The M18 and M20 Protective Entrances are ordinarily used with the S-250 and S-280 Shelters. In this case, a customer building a new shelter associated with the Joint Tactical Ground System specifically requested a number of modules be provided as soon as practical.

## **OBSCURATION AND DECONTAMINATION SYSTEMS**

### **Obscuration**

#### ***M56 Smoke System***

The M56 Configuration Control Board approved two Engineering Change Proposals on 3 Apr 03. The first change revised the packaging for the turbine fuel filter to use commercial packaging material specifications. This change also deleted the Quality Assurance Provisions for this "commercial off the shelf" item. The second change "fine tuned" previous changes for the intruder speed reducer and ballistic safety panels.

ECP Y50-306 has been completed and distributed. This change refines the turbine starting and control with an increase in fuel pump output during starting and a new high-pressure fuel pump. The turbine speed transducer minimum output voltage requirement was raised for increased reliability. The M56 electrical generator display lamp was changed from amber to green since it is informative and not a warning light.

#### ***M201A1 Fuzes***

Our Decon/Smoke Team is in the process of obtaining a hazard classification for the M201A1 MOD2. The M201A1 MOD2 is identical to the M201A1 with the following exceptions: the M201A1 Fuze MOD2 is bent at the tip of the lever 1/2", it has a brown band at the tip of the lever, and it has an extra safety pin. Once the hazard classification is obtained, a NSN can be assigned.

#### ***M18 Colored Smoke Grenades and M713, 15,16 40mm Ground Markers***

Personnel from the Decontamination/Smoke Team completed an Engineering Change Proposal to delete the requirement for the government to provide or validate dye purity standard samples for nine dyes and mixes. However, these changes will not relieve suppliers from their requirements to provide both dye samples and purity certifications.

#### ***USMC Km03 Floating Red Phosphorus Smoke Pots***

Personnel from the Decontamination/Smoke Team traveled to the US Marine Corps Reservation, Quantico, VA, to participate in a System Safety Working Group Meeting on the KM03 Red Phosphorus (RP) Floating Smoke Pot. ECBC is assisting the USMC in evaluating the KM03 for suitability of adoption into their systems. The KM03 has RP fill, and is produced by Diehl Munitionssysteme, Germany. Various design modifications that resulted in improved performance, changes in packaging and shipping configurations, Technical Data Package updates, Program Documentation, Deliveries, Program and Testing Schedules were also updated.

#### ***M98/M99 Non-Lethal Grenades***

A contract request was initiated with the Pine Bluff Arsenal Contracting Office to buy modified grenade body assemblies from Lewis Engineering in Marshall, TX. The modified design uses a stronger aluminum body material to allow removal of the grenade reinforcement sleeve added to the current design. The purchase will support an Engineering Design Test to verify reliability and performance of the modified design.

### ***Fast Obscurant Grenades (FOG)***

The ROS Team was funded by Night Vision Labs to develop a Fast Obscurant Grenade (FOG) that is non-toxic, instantly disseminating, hand-tossed, and provides obscurant in the visual spectrum. Design work has begun; preliminary tests are ongoing on various burster designs and pyrotechnic formulations.

### ***M201A1 Fuze Salvage Status***

In late July, ECBC Rock Island Engineering and ECBC Edgewood Quality Assurance witnessed the start up of the PBA production line for the M18 Smoke Grenade utilizing the newly installed sealant dispensing equipment. The sealant is added in two areas of the fuze body to assure a good environmental seal at the fuze to grenade interface. After a couple minor adjustments, the First Article Test (FAT) Lot was produced. All FATs were then successfully passed, and the Configuration Manager approved returning to full production that began in August.

### **Decontamination**

#### ***M291/295 Decontamination Kits***

An Engineering Change Proposal, submitted by Pine Bluff Arsenal (PBA) to change the pouch material on the M291 Kit, was approved on 14 May 2003. The change allows for the use of a less expensive pouch material for the M291 Skin Decontamination Kit. Two alternative materials have been tested by PBA and both proved to work well in their automated equipment. This change will save the government over \$25K per year in material costs while M291 kits are being produced.

#### ***Joint Service Family of Decon Systems (JSFDS)***

The reorganization taking place within the JPEO, as well as on the JSFDS program, has provided a unique opportunity to address several major areas of concern, chiefly among them is the single Operational Requirements Document (ORD). The ORD has been re-written into four draft ORDs, as follows: Personnel Decontamination System, Man-Portable Decontamination System, Transportable Decontamination System, and Stationary Decontamination System. The ECBC JSFDS Team received the most recent set of Draft ORDS and is working to provide meaningful coordinated input.

### **SINGLE ROUND CONTAINER PRODUCTION**

ECBC (RI) awarded a contract to Destiny Machine Shop in Archie, MO, for steel flanges and covers used in the manufacture of Single Round Containers at Pine Bluff

Arsenal. Production of the containers is expected to be completed by the end of September. These containers support the Chemical Material Agency's Depot Stockpile Operations in over-packing leaking chemical ammunition in storage at U.S. Army depots.

### **12" BY 56" MULTIPLE ROUND CONTAINER (MRC) PRODUCTION**

ECBC (RI) received funding for the fabrication of 12" by 56" MRCs. All components will be commercially obtained with the Last Assembly Point (LAP) being done at Pine Bluff Army Depot. It is anticipated that production of the containers will be done during the October to December timeframe. These MRCs are used in support of all non-stockpile operations for over packing leaking chemical ammunition found at formally used defense sites.

### **7" BY 27" SINGLE ROUND CONTAINER (SRC's) ASSEMBLY**

In June, three 7" by 27" SRC First Article Test (FAT) containers were fabricated at Pine Bluff Arsenal. These containers, after assembly, passed all dimensional and helium leak tests. Additional testing was completed in August on additional containers. These containers were tested by Data Systems in Delafield, WI. ECBC - Rock Island was responsible for the design engineering, program management, and certification testing of these containers. These containers now meet United Nation Performance Oriented Packaging (UNPOP) requirements. Tests included low and high frequency vibration, drop tests to 40ft., hydrostatic, compression and rough terrain transportability tests. These SRCs are used in support of stockpile operations for over packing leaking chemical ammunition found at Army Depots.

### **MULTIPLE ROUND CONTAINER (MRC) INVENTORY MANAGEMENT**

ECBC has completed a formal inventory of the entire MRCs stockpile located at Rock Island. We began the shipping, receiving, warehousing, inventory control, and database management for the complete MRC program during the 2nd quarter of FY03. This is a long-term program that supports other MRC functions currently being done by ECBC (RI). These MRC's are used in support of non-stockpile operations for over packing leaking chemical ammunition found at formally used defense sites (FUDS).

**ARMY KNOWLEDGE ONLINE (AKO)  
WEBSITE FOR RDECOM SPIs**

Updated packaging technical data for five SPIs has been posted to the AKO Website.

**FED-STD-595**

In an effort to determine if there is still a need for each of the colors listed in FED-STD-595, Colors Used in Government Procurement, the General Services Administration (GSA) requested that activities review their technical documents and compile a list of all color numbers that are used. The Standardization Team reviewed the ECBC specifications and standards referencing FED-STD-595 and compiled an initial list. With the aid of other affected teams at Edgewood and Rock Island the drawings and other technical documents were also reviewed and a final list was developed. This list was provided to the chemist at GSA responsible for the upcoming revision of FED-STD-595. This should ensure that color requirements for ECBC hardware will continue to be adequately defined in subsequent revisions of this standard.

**CONFIGURATION MANAGEMENT (CM)  
ON-LINE TRAINING**

Personnel from ECBC (RI), RDECOM IMMC, TACOM-RI, and ARDEC (RI) participated in the Configuration Management training offered by members of the ECBC Engineering Data Management (EDM) Team in July. The EDM system will allow government personnel and contractors to generate, submit and process CM actions on line. The training included a demonstration and instructions on how to access and use the system, which is expected to be in place in the near future.

**HELP LINES/TOLL-FREE NUMBERS**

Chemical Equipment	TEL: Germany 0130810280 Korea 0078-14-800-0335 CONUS 1-800-831-4408 FAX: 1-410-436-3912 (TOLL CALL)
Smoke/Obscurants	TEL: 1-888-246-1013 FAX: 1-410-436-2702 (TOLL CALL)
Environmental Quality	TEL: 1-410-436-6588 (TOLL CALL) FAX: 1-410-436-8484 (TOLL CALL)

# COLLABORATION



Recent achievements and significant actions in our continuing commitment to technology transfer follow:

## COOPERATIVE R&D WITH INDUSTRY AND ACADEMIA

### Cooperative Research and Development Agreements (CRADA)

ECBC signed a CRADA with AMETEK Aircontrol Technologies Limited (ATL) in May. ATL has designed an integrated Regenerative Nuclear, Biological, and Chemical Collective protection system that meets the requirements of the United Kingdom (UK) MoD, for use on future vehicle and other platforms. The system utilizes a Pressure Swing Adsorption (PSA) technology with a final high temperature bed clean up (PSA+T). This CRADA will afford ECBC the opportunity to investigate the potential performance of such systems and their relevance for use in U.S. systems and platforms.

A CRADA was signed with Alion Science and Technology in May. The purpose of this CRADA is for ECBC and Alion to conduct collaborative research and development in the identification of new decontamination solution and methods to determine their efficacy.

A CRADA was signed with Smiths Detection - Edgewood (SDE), Inc., in May. SDE is a wholly-owned subsidiary of Smiths-Aerospace, Inc. Prior to and independent of this CRADA, SDE developed an instrument (Bio-Seeq) to provide a portable polymerase chain reaction (PCR) platform for use in the field to detect biological warfare agents. The Bio-Seeq portable platform is also appropriate for use by first responders to detect biological threats in civilian areas. This CRADA is supported by two Statements of Work (SOW). The objective of the first SOW is to create a menu of at least four reagent systems for the Bio-Seeq instrument that can be transitioned into production at SDE. The objective of the second SOW is to adapt, optimize, and validate Ricin I-PCR assay for field use in the Bio-Seeq.

A CRADA with The Titan Corporation was signed in June. Titan has a Binary Ionization Technology (BIT) which is an innovative and patented method of creating a high concentration of oxidizing and sterilizing chemical

species that can survive for long periods of time at normal atmospheric pressures, temperatures, and humidity. BIT has been demonstrated to have very high biological kill and encouraging chemical denaturing when the working solution is hydrogen peroxide. The BIT technology may have promising potential for military chemical decontamination. Under the auspices of this agreement, ECBC will conduct efficacy testing of BIT.

A modification to the CRADA with A-Conversion, LLC, was signed in June. The modifications are technical in nature and will extend the CRADA duration for a total of 2 years.

A CRADA with ITT Industries Advanced Engineering and Sciences Division was signed in June. Under this CRADA, investigation of Raman spectroscopy in the basic research areas of CB Raman signatures and scattering cross sections in support of ITT's LISA program and ECBC's Surface Contamination Detection program will be conducted. Raman signature and cross-section measurements will be performed on both agent simulants and actual agents (to include non-traditional agents). These measurements will be performed in compliance with surety requirements and safety procedures. This CRADA will allow ITT personnel to work in ECBC facilities and ECBC personnel to work in ITT's facilities.

A CRADA with Sterilex Corporation, Owings Mills, MD, was signed in June. Under the auspices of this CRADA, ECBC will characterize the antimicrobial efficacy of experimental combinations in a designed study. The results of this study are expected to indicate the ability of those experimental combinations to combat antimicrobial resistance. This CRADA is a product of the APG-Maryland Technology Development Corporation Technology Showcase held at the Edgewood Area Conference Center on 26 Mar 03.

A CRADA was signed with the Life Sciences Division of Bruker Optics, Inc. in August. ECBC's Passive Standoff Detection and Microbiology/Biosafety Level III Laboratories will work with Bruker to establish an infrared spectral database of biological warfare agents. The infrared spectral database will benefit the Joint Services

by providing live agent properties of value to point and standoff detection research efforts. Our Microbiology/Biosafety Level III Laboratories are leading the efforts to develop the database, and our Passive Standoff Detection Team will work with Bruker scientists to develop detection and discrimination algorithms from the spectral data.

## **Interagency Agreements (IAA)**

An IAA between ECBC and the USDA's Animal and Plant Health Inspection Service was signed in March. A new task under that IAA, in support of USDA's Food Safety & Inspection Service (FSIS), was approved in late March. Under the auspices of the IAA and the task, ECBC will provide technical support and expertise to the USDA's FSIS to conduct analyses and potential storage of food samples for the presence, exposure, release(s), and/or detection of biological agents that may present an imminent and substantial danger to the public health or welfare of the environment as it is in support of emergency responses.

A modification to an IAA with NIH's National Institute of Environmental Health Sciences was signed in July. This IAA modification extends the period of performance to Jun 04 and provides funds for additional laboratory experiments.

## **Testing Services Agreement (TSA)**

ECBC signed a TSA with Scientific Applications & Research Associates (SARA), Inc., in March. SARA is under contract to the Marines to develop a Multi-Sensor Grenade. The Pyrotechnics Team is providing their unique expertise to perform safety and performance testing to evaluate initial pyrotechnic formulations and the full-scale devices. This TSA will increase their safety and performance levels through an interactive improvement testing program.

A TSA with Cyrano Sciences, Inc. (CSI) was signed in April. The Cyranose 320 (C320) is a COTS chemical vapor detector device. The purpose of this testing is to develop a minimal training set for Cyranose's current technology with select (real) chemical agents and to validate the training set with subsequent challenge tests. This TSA will expand ECBC's awareness and knowledge of testing and validation of commercial chemical agent detector devices.

A TSA with Hunter Manufacturing Company was signed in April. This is a companion to another TSA with Hunter, which was recently reviewed, approved, and signed. It involves testing of carbon and filters manufactured under government contract. Some of the work overlaps with the previous TSA; however, the testing will be performed by a different ECBC component, the Protective Equipment Team. Specifically, the testing objectives are to ensure that

the ASZM-TEDA carbon to be used in manufacturing M18 and M12A2 filters meets all of the requirements of EA-DTL-1704A; to perform confirmatory production acceptance testing of M18 and M12A2 filters using CK; and to test carbon from the filter production line with CK to confirm no degradation.

A TSA with QuickSilver Analytics, Inc. (QS) was signed in April. The purpose of this TSA is to challenge miscellaneous items of hardware with CW Agents to determine their response, sensitivity to CW agents, the detrimental effects of agent exposure on this equipment, and the completeness of decontamination following exposure to CW agents. QS will not be conducting any hand-on agent operations; only QS personnel qualified in the PRP act as observers.

A TSA with Aeero Company was signed in April. Under this TSA, human factors assessment and human use tests will be conducted on the AOSafety(R) Respirator Heat Management System (RHMS)-Thermal Manikin Headform, installed in a full-facepiece respirator. The purpose of this testing is to determine the ability of the AOSafety(R) RHMS to reduce the thermal encumbrance of a full-facepiece respirator and alleviate respirator thermal discomfort.

A TSA with S3I LLC was signed in May. The purpose of this TSA is to test/characterize S3I's aerosol sampler to determine its sampling efficiency. The Aerosol Sciences Team will employ its Ink Jet Aerosol Generator to generate different sizes and concentrations of bioparticle clusters.

A TSA with Essex PB&R Corporation was signed in June. The purpose of this TSA is to provide chemical agent testing on Swatch materials to be used on the company's VRU Hood/Neckseal Assembly.

A TSA with Raytheon Company was signed in June. The purpose of this TSA is to provide environmental sand and dust testing of electronic units produced by Raytheon.

A TSA with Airguard was signed in June. The purpose of this TSA is to provide DMMP and airflow resistance testing on carbon absorbers.

A TSA with Guild Associates, Inc., was signed in June. Under the auspices of this TSA, ECBC will conduct environmental testing of 108 supplied M100 (Sorbent Decon System) samples. Test data will be used to establish material system lifetimes for worldwide conditions.

A TSA with Survivair was signed in June. The purpose of this TSA is to determine the effectiveness of Survivair's SCBA and Shalon gas mask against chemical agent GB.

A TSA with North Safety Products was signed in July. North Safety Products is in the process of developing an NBC escape hood for protection against WMD. The purpose of this TSA is to conduct permeation testing of materials and penetration testing of cartridges to determine if they will provide protection against chemical agents.

A TSA with Thermo Electron Corporation was signed in July. The purpose of this TSA is to assess performance of Thermo Electron's Transport Kit, an FTIR spectrometer that can be used to identify unknown solids, powders, pastes, gels, and liquids. The technique involves placing a sample on top of a diamond crystal embedded in a stainless steel disk. The process is non-destructive to the sample or the instrument. Unknown samples are identified by comparison with reference databases. The Applied Test Team will perform the detector testing, which is designed to characterize the CW agent identification capability of the instrument. The Bio-Technology Team will perform bio-agent testing to demonstrate the instrument's ability for bio-agent detection.

A TSA was signed with Airboss-Acton International in August. This company manufactures protective respirators for the military and first responders. They would like their mask and four other commercially available masks to be tested with chemical agent to determine their relative effectiveness.

A TSA was signed with Smiths Detection in August to characterize mail-sampling equipment they have developed. Half of the air samples taken within the device will be archived for analysis by an independent laboratory at a later date.

### **Patent License Agreements (PLA)**

In April, a PLA with QuickSilver Analytics, Inc., Abingdon, MD, was signed. This Non-Exclusive PLA is on behalf of U.S. Patent Application Serial Number 09/974,436 filed 10 Oct 01, entitled "Chemical and Biological Sampling Kit and Device and Method of Use Thereof." This PLA will provide for commercial development and production of the ECBC-invented "BiSKit". On behalf of this licensing effort, the Business Development Team recognizes the contributions of inventors Dr. Peter Emanuel and Mr. Mark Schlein; Mr. John Biffoni and Ms. Vicki Upchurch, SBCCOM Legal Counsel; and Mr. Blake Sajonia and Ms. Christina Frain, APG Business Development Office.

### **Patents Awarded**

**U.S. Patent 6,599,733**, "Microbial Biodegradation of Phosphonates," by Drs. Ilona J. Fry, Joseph J. DeFrank and James P. Earley. This patent deals with the biodegradation of the hydrolysis product of Sarin (GB). The invention combines the use of sequencing batch reactor (SBR) systems and a unique consortium of phosphonate-degrading microorganisms obtained from a variety of sources and after many months of enrichment culturing. This work was conducted as part of the Alternative Technologies Program for Chemical Stockpile Demilitarization.

POC: Office of Research and Technology Applications, DSN 584-4438, commercial (410) 436-4438, or E-mail to [technical.outreach@apega.army.mil](mailto:technical.outreach@apega.army.mil)

### **TECHNICAL INDUSTRIAL LIAISON OFFICE**

#### **Small Business Innovation Research (SBIR)/Small Business Technology Transfer (STTR)**

Small businesses can propose new ideas to meet the military's research and development needs through the SBIR and STTR programs. Businesses with less than 500 employees are eligible to compete in these programs. Under the STTR program, the small business must team with a research institution. The DoD publishes two SBIR solicitations and one STTR solicitation every year. Each solicitation contains numerous topics addressing various research and development requirements.

The SBIR process is conducted in four steps: Phase I, Phase II, Phase II Plus, and Phase III. Phase I evaluates the scientific and technical merit, and feasibility of a novel concept during a six-month study. Phase II is the development of a prototype, while Phase II Plus expands on Phase II with an effort to meet the product, process or service requirements of a third-party investor. Phase III does not provide SBIR funding but is the commercialization of the results of Phase II in the form of a viable product or non-research and development service for sale to military or private sector markets. Phase III is funded either privately or through a Department of Defense acquisition program. All SBIR money goes to the small business with the ultimate goal of commercializing the technical achievements of the research and development.

A Call for Topics is going out for DoD SBIR Solicitation 04.1 which will be released in October. Topics were due by 16 June.

Seven Phase I proposals from the DOD 03.1 SBIR solicitation have been selected for funding. These proposals address the following topics:

- Synthetic Recognition Elements for Chemical and Biological Sensors and Assays
- AOTF Based Imaging Sensor for Enhanced Stand-off Chemical Detection
- Standoff Detection of Biologically Contaminated Surfaces
- Improved Protein Manufacturing in Insect Expression Systems (2 proposals selected)
- Aerosol Collector Technology
- Electron Microscopy for Mobile Laboratory Systems

***Recent SBIR Phase II contracts were awarded to:***

A new Phase II SBIR contract was awarded to Physical Sciences, Inc. Under this effort, Physical Sciences will develop a robust field-deployable assay for detection of biological pathogens (spores, bacteria, viruses) in complex aqueous samples.

**Small Business Technology Transfer (STTR) Program**

The 2003 STTR solicitation closed on April 16. A total of 45 proposals were received in response to five ECBC Topics. Six of the proposals were selected for contract award. The proposals address the following topics:

- Narrow-Band Infrared Obscurants
- Enhanced Vapor, Aerosol, and Particulate Sampling System for Optical Trigger Technologies
- Obscurant Dissemination
- Metabolic Bio-inspired Batteries (two proposals selected)
- Optical Communication Techniques for Improving Standoff Detection of Chemical and Biological Agents

Two Phase II STTR proposals have been selected for contract award. The proposals are entitled:

- Detection of Liquids on Surfaces using Long Wave Infrared Hyperspectral Imaging Spectroradiometer
- Standoff Chemical/Biological Sensor Detection Algorithms

For further information regarding the SBIR/STTR programs, go to <http://www.acq.osd.mil/sadbu/sbir/>

**Broad Agency Announcement (BAA)**

The following BAA contracts have recently been awarded:

- Mesosystems Technology, Inc. was awarded a contract to develop a Thermocatalytic Air Purifier, which uses heat and a specially designed catalyst to neutralize chemical agents and deactivate biological pathogens. This device will be applied to the improved removal of trace-level contaminants within collective protection shelters.
- Engineering Technology, Inc. was awarded a contract for exploring new solutions to the production of infrared screening and absorbing aerosols that significantly exceed of the state-of-the-art.
- ANP Technologies, Inc. was awarded a contract to develop a dendrimer-based handheld immunological test ticket system for water monitoring applications.
- Strategic Technology Enterprises, Inc. was awarded a contract to evaluate, modify, optimize, and verify the effectiveness of two decontamination systems, based on Vaporized Hydrogen Peroxide (VHP).
- A Cooperative Agreement was signed between ECBC and A-Conversions, LLC. Under this Agreement, A-Conversions will reduce to commercial practices a proven, non-invasive process for the destruction of asbestos and asbestos containing material (ACM) to a non-hazardous substance in a cost-effective manner. In turn, this effort will expand ECBC's technical base and core competencies.
- A contract was awarded to Sarnoff Corporation to develop an electrostatic aerosol collector, which is expected to be lighter, smaller, and require much less power than those used today.
- A contract was awarded to Physical Sciences Inc. to exploit recent advances in focal plane array and tunable

filter technology to address the requirements of the Joint Service Wide Area Detection program.

The ECBC BAA can be accessed at <http://www.ecbc.army.mil/about/baa.htm>

For additional information on the Technical Industrial Liaison Office at Edgewood, please call commercial (410) 436-2031 or DSN 584-2031, or E-mail [technical.outreach@apea.army.mil](mailto:technical.outreach@apea.army.mil)

## **INTERNATIONAL COOPERATIVE R&D**

### **The Technical Cooperation Program (TTCP) Chemical, Biological, and Radiological Defense (CBD) Group**

The U.S. National Representative for the TTCP Group on CBR Defense, hosted a U.S. Position Meeting in April at Edgewood, to develop positions for the annual meeting which was held in May, in Australia. Each of the Technical Panels and Action Groups briefed on their progress over the past year, results of their meetings, status of actions and any issues that required the National Representative's involvement. Topics covered were the ongoing Technical Panels and Action Groups on Hazard Assessment; Chemical Toxicology; Low Burden Integrated NBC Protective Clothing; Radiological Hazards; Detection of Biological Agents; and Passive Standoff Chemical Detection. Representatives attended from OSD, DTRA, USAMRIID, NATICK, Air Force, Navy, and Marines.

### **US/UK/CA CBR MOU**

On 6 Aug 03, Mr. Zarzycki held a position meeting at ECBC for the U.S./UK/CA CBR MOU. This meeting prepared the U.S. position for the upcoming US/UK/CA CBR MOU Program Officers/Requirements Officers meeting, held in CA in September. Current activities underway were reviewed, and the U.S. approach for proposing new collaborative efforts was developed.

### **US/UK Joint Venture Oversight Meeting**

ECBC hosted the US/UK Joint Venture Oversight Group (JVOG) in July. The JVOG has a US/UK bilateral policy and operations focus cochaired by DUSD (TSP & CP) and

DG-ISP. Approximately 40 people in various organizations responsible to policy, R&D, Medical Health Issues and Operations were involved in the meeting.

## **International On-Line (IOL) Training**

In April, a representative from HQ AMC, was invited to Edgewood to introduce us to the initial release of International On-Line (IOL), the web-based version of the U.S. Army International Agreements Tracking Systems (IATS). IOL is an Unclassified DOD Computer Database that is used to track all active and proposed international cooperative R&D agreements for all services (Army, Navy, and Air Force) and is accessible to all U.S. personnel involved in international programs. Personnel from various installations were in attendance. They were provided hands-on training and an overview of typical information to include titles, descriptions, important dates, status, points of contact, and retrieval of electronic copies of agreements and other supporting documentation.

## **Visits**

LTC Robert Campbell, Commander of the Standardization Group-Canada, visited ECBC in April. This was an informal meeting to brief LTC Campbell on current ECBC interests so that he will be able to identify potential technology solutions in Canadian industry, academia, and government. The visit included briefings on the Center, Engineering and Research and Technology Directorates.

A meeting was held in May at the Edgewood Area Seminar Center. Five representatives from the Republic of Korea attended. ECBC personnel briefed the visitors on the current status of ECBC research and development programs. Discussions were held concerning potential for collaborative efforts. It was agreed that the current collaboration is beneficial for both partners and should be expanded. Note: This meeting was in support of DEA-1173.

POCs: ECBC International Division, Commercial (410) 436-2552/5375, DSN 584-2552/5375, or Commercial (410) 436-5252, DSN 584-5252, and International Office-NSC, Commercial (508) 233-4218

# SENIOR LEVEL POSITIONS FILLED AT EDGEWOOD CB CENTER

Recently, three senior level positions have been filled at ECBC, making the organization stronger, more robust and better equipped to meet critical challenges presented in national defense and homeland security.



Dr. Raymond Mackay was appointed Director of the Research and Technology (R&T) Directorate. Formerly a Clarkson University professor and Program Director of the university's National Science Foundation, Mackay holds a Ph.D. in Chemistry from the State University of New York at Stony Brook. With an

extensive background in chemical engineering and research, Mackay offers ECBC a wealth of knowledge in best science and technology solutions and the execution of fundamental studies to enhance knowledge of chemical and biological defense technology.



Mr. Jeffrey L. Hinte was recently promoted from Advanced Planning and Initiatives (AP&I) Business Development Division Team Leader to AP&I Director. Hinte has over 14 years of experience directing military, civilian, and contractor personnel working

in laboratory and program management of chemical, biological, and obscurant defense. As AP&I Director, Hinte will oversee the U.S. Chemical Biological Defense,

Science and Technology, International Cooperative Programs; technology transfer and cooperative research and development initiatives, patents, and intellectual property issues; and lead strategic and business planning efforts at ECBC.



Dr. Joseph Corriveau assumed the role of R&T Deputy Director in June. Dr. Corriveau joins ECBC from the Office of the Deputy Assistant to the Secretary of Defense (Chemical/Biological Defense) where his primary responsibility

involved program planning, coordination, integration, and oversight of science and technology activities. Specific duties included serving as Executive Secretary for the annual Chemical and Biological Defense Technology Area Review and Assessment, and Executive Secretary of the Counterproliferation of Weapons of Mass Destruction Panel of the Joint Warfighter S&T Plan.

Join us in congratulating and welcoming our colleagues to their new positions!

# ECBC PROVIDES OPPORTUNITIES FOR "AT RISK" YOUTH

ECBC is helping Maryland's "at-risk" youth find direction through cutting-edge science via a program called the Maryland National Guard Freestate ChalleNGe Academy.

A voluntary five-month residential program held at the Aberdeen Proving Ground, Md., the Freestate ChalleNGe Academy gives participants, known as cadets, an opportunity to earn a high school diploma and gain real workplace experience. The program boasts a popular job-shadowing component whereby after touring potential military and commercial job shadowing sites, the cadets apply for job placement. Once assigned a position, cadets will work side-by-side with staff from a sponsoring organization two days per week for one month.

On May 7, 2003, this year's cadets arrived in uniform to tour ECBC's Engineering Directorate and learn about job shadowing opportunities. ECBC is usually one of the cadets' top places to work and placement is competitive. Commenting on the program's success at ECBC, engineering services business unit leader Ron Pojunas said "we were impressed right from the start with the organization and the results. The concept is to place the cadets in a mentoring environment and give them hands-on experience and direction. Many cadets go on to college and/or the military services."

During the fall 2002 session, ECBC accommodated eight cadets in a range of positions with the Engineering Directorate including the computer aided design and engineering group, the mask test team and the environmental field testing team. Engineering Directorate staff challenged and encouraged the cadets' knowledge and capabilities. In one instance two cadets with the computer aided design/computer aided engineering team used sophisticated scanning and fabricating equipment to electronically scan their own faces and hands. The teenagers

then used the resulting molds to make a metal plaque commemorating their participation in the program. The keepsake was presented to Academy staff and is currently on display at the Academy's headquarters.

"It's always possible that [cadets] might come back to ECBC eventually, but this is really about them," said team lead Mark Schlein. "Through the mentoring, we emphasize the different levels of education you need to do different kinds of technical work...this is something the kids haven't seen before."



*Academy "cadets" learn about ECBC capabilities*

# GIVING NEW MEANING TO CUSTOM FABRICATION—ONE TEAM'S EXPERIENCE WITH A UNIQUE PRO-BONO EXERCISE

When ECBC's Advanced Design and Manufacturing (ADM) team was approached by Cooperative Research and Development Agreement (CRADA) partner Direct Dimensions to assist with a pro-bono project benefiting underprivileged children, they jumped at the opportunity. Whenever there is a lull in priority military client work, the team welcomes opportunities to sharpen current capabilities and add new skills to their portfolio by working with commercial customers. However, at the start of this effort, little did the team know that while busy honing skills they also would rub elbows with NFL football superstar Ray Lewis of the Baltimore Ravens.



*ADM team member poses with Ray Lewis and joint creators of the marble bust*

The task at hand was to co-create a one-of-a-kind life-size marble bust of the football player that would then be auctioned at the Second Annual Ray Lewis Foundation Auction. Proceeds were to go to the Ray Lewis Foundation, a non-profit charity organization dedicated to providing assistance to disadvantaged youth.

Upon receiving an electronic 3-D model of the star's head and shoulders, the ADM team got started fabricating the model into ABS plastic. Because Center policy dictates that charity work be performed after hours, project leads Rick

Moore and Lester Hitch spent time on the weekends and in the evenings tackling the job. "In the business of rapid response, we're used to tough deadlines," said Hitch, a student contractor. Once their contribution was completed the team sent the prototype pattern to a third partner, a noted plastic surgeon and sculptor who cast the pattern in marble resin.



The finished piece was auctioned at the gala and sold at a winning bid of \$7,000, the highest bid made amongst hundreds of autographed sports memorabilia. Present at the benefit, Moore and Hitch were able to meet Lewis and share in the excitement of the sizeable charity contribution they played a role in realizing.

Commenting on the challenges the team faced in crafting the bust prototype, Moore explains the lessons learned were invaluable to their client work. "Our CRADA partner is an expert in reverse engineering," says Moore. "Through this initiative, we collaborated on the laser scanning of a human being. As we fine-tune our ability to manipulate unique geometric files, imagine what we can do with this knowledge...for example we could investigate the feasibility of scanning soldiers and developing custom fitted protective equipment."

# BRING YOUR CHILD TO WORK DAY 2003—ANOTHER HUGE SUCCESS

The Federal Women's Program sponsored the 2003 Bring Your Child to Work Day on June 24. Open to children between 8 and 16 years of age, this year's agenda was jam-packed with fun-filled activities ranging from presentations on the manipulation of digital photos to learning how chemical agent is removed from ton containers.



*Bring Your Child to Work Day participant tries on protective mask*

Technical Escort kicked off the day, leading the kids in physical training exercises and marching in formation. Later, they taught the children how soldiers communicate in the field via walkie-talkie, and let the kids try on protective masks and sample the unit's Meals Ready to Eat.

Digging into food a bit less exotic, the children were treated to a picnic lunch at Skippers Point where they talked with APG's Natural Resource Police. Police staff welcomed the kids aboard their patrol boats and shared information about their mission and daily work.



*ECBC employees with their kids enjoying the day's festivities*

By the day's end, the kids had visited sites such as the Chemical Demilitarization Training Facility and Audio-Visual Services where each child left with a souvenir photo of their tour group. "Everyone had a great time," says co-organizer Barbara Knapp, "we estimate that over 160 parents and kids attended the event."

# PEOPLE



## EXCELLENCE IN TECHNOLOGY TRANSFER

ECBC received two 2003 “Excellence in Technology Transfer” Awards from the Federal Laboratory Consortium (FLC). The FLC annually recognizes employees who have successfully transferred a technology that was developed by a Federal laboratory to the commercial marketplace. One of the ECBC awards this year goes to members of the Edgewood Chemical/Biological Forensic Analytical Center, Ms. Monica Heyl, Mr. Charles Henry, and Dr. Dennis Reutter. These individuals are being recognized for their work on the “Design, Development, Training, Fielding, and Continued Consultation for Mobile Laboratories.” The awards were presented in May 03 during the FLC’s National Meeting.

## ECBC EMPLOYEE ACKNOWLEDGED BY FEMA

James Genovese, of ECBC’s Technical Assistance Team, was acknowledged by the Federal Emergency Management Agency and the National Fire Prevention Association in an Official Report to Congress for the technical advisory work he performed in support of Congressionally mandated “A Need Assessment of the US Fire Service.” Mr. Genovese provided guidance on CB response aspects related to emergency service. Future CB response technologies were identified that would bolster firefighters capabilities when confronted with these non-conventional threats.

## ECBC HAS FEB FINALISTS

The Baltimore Federal Executive Board has notified ECBC the following individuals will be recognized during their Excellence in Federal Career Awards Luncheon in May.

### Gold Winner:

Dr. Kevin O’Connell, Category IIa, Outstanding Professional (Technical, Scientific & Program Support)

### Silver Winner:

Peter Schlitzkum, Category V, Outstanding Trades or Crafts Employee

### Bronze Winners:

Ronnie Eckstein, Category IIIa, Outstanding Para-Professional (Non-supervisory). Mr. Eckstein’s nomination reflects his outstanding contributions to the Center through his dedication to provide major contributions on virtually all Computer Aided Engineering in-house design projects.

Shawn Heinlein, Category Xa, Rookie of the Year Professional. Mr. Heinlein’s nomination reflects his dedication and outstanding support of the Center through his efforts to support the Monitoring Branch. He has proved to be a valued leader in both the Center labs and at off-site projects.

Sharon Hoffman, Category Ib, Outstanding Supervisor, Grade 12 & Below. Ms. Hoffman’s nomination reflects her dedication to quality leadership and her desire to stand as a role model for up and coming leaders.

Kathy Jenkins, Category Iib, Outstanding Professional (Administrative, Management & Specialist). Ms. Jenkins’ nomination reflects her outstanding dedication to provide our Center the quality support needed to ensure our continued growth as a vigorous organization.

Eva Mims, Category IV, Outstanding Clerical. Ms. Mims’ nomination reflects her exceptional performance and dedication to the mission of our Center. Throughout the challenges of an ever-growing organizations, she maintained the highest levels of proficiency and expertise.

Horace Pearce, Category Ia, Outstanding Supervisor, Grades 13 & above. Mr. Pearce’s nomination reflects his outstanding record of achievements in discharging his duties as a supervisor and in leading and conducting support of customer programs which have been vital to both the warfighter and Homeland Defense efforts.

Dr. Vipin Rastogi, Category Xa, Rookie of the Year Professional. Dr. Rastogi’s nomination reflects his superb efforts and innovative technical approaches, which have proven to be extraordinarily rewarding for the Center. His efforts have already yielded critically important breakthroughs in the effort to combat terrorism and create deterrents to the use of weapons of mass destruction.

## **ECBC SCIENTIST REPRESENTS ARMY ON US EPA NATIONAL STEERING COMMITTEE FOR ECOLOGICAL SOIL SCREENING LEVELS**

Dr. Ronald T. Checkai, Environmental Toxicology Team Leader was the U.S. Army Representative on the U.S. Environmental Protection Agency National Steering Committee for Establishing Ecological Soil Screening Levels (Eco-SSL). The development of Eco-SSL eliminates the need for repetitious and costly toxicity-data literature searches; increases national consistency; and allows resources to be focused on key site issues needed for critical decision-making. Dr. Checkai also Co-chairs the Eco-SSL National Task Group that established the Eco-SSL guidance for Soil Invertebrates and Terrestrial Plants.

## **ECBC/HOWARD UNIVERSITY COOPERATION IN NANO TECHNOLOGY**

Dr. Harold D. Banks of ECBC's Agent Chemistry Team has been selected as a member of the external Scientific Advisory Board of the Keck Center for the Design of Nanoscale Materials for Molecular Recognition at Howard University, Washington, D.C. The board consists of an interdisciplinary group of investigators from diverse branches of science and engineering. The focus of the Center is the study of the science and engineering fundamental to the design of molecular detection and identification devices using nanotechnology.

## **MILITARY IMPROVED RESPONSE PROGRAM TEAM ADVISOR TO COLUMBIA UNIVERSITY**

The Mailman School of Public Health at Columbia University asked Dr. Mohamed Mughal to serve as an advisory board member for its effort to develop a Model Pediatric Component for State Disaster Plans. The model is intended to provide guidance regarding the needs of children in disaster and terrorism response.

## **R&T INDIVIDUAL APPOINTED TO IST BUSINESS AREA COMMITTEE**

Mr. William Ginley, NBC Battlefield Management Team, served as a panel member for the Information Science and Technology (IST) Business Area Committee (BAC). The IST BAC met in June to review IST continuation proposals and

FY04 new starts. The panel evaluated, debated and then scored all new start proposals. Recommendations on future process were also debated and provided to the IST Business Area Manager.

## **CB SERVICES STAFF MEMBER NAMED ARMY WORKING GROUP REPRESENTATIVE**

Marylalice Miller has been named as the new Army Working Group (WG) Representative of the Joint Group-Pollution Prevention (JG-PP). The JG-PP is a partnership between the Military Services, National Aeronautics and Space Administration, and Defense Contract Management Agency, chartered by the Joint Logistics Commanders to reduce or eliminate hazardous materials or processes within the acquisition and sustainment communities. By establishing these partnerships, JG-PP addresses common problems through shared efforts to produce joint solutions. The WG has teleconferences every other week and meets face-to-face roughly twice a year. Her role involves participating in a project selection process every year, aiding the WG in funding and tracking project progress, and encouraging implementation within the Army.

## **ECBC CHIEF SCIENTIST PUBLISHES 14TH BOOK**

ECBC's Chief Scientist, Dr. Harry Salem, is no stranger to the publishing industry nor toxicology. He recently joined the two in publishing his 14th book entitled, "Alternative Toxicological Methods for the New Millennium." The book was edited by Dr. Salem and Sidney Katz of Rutgers State University, with contributions from over 125 international scientists from industry, government and academia. The book explores the development and validation of replacement, reduction, and refinement alternatives of traditional animal testing. The book presents the state-of-the-art validation and regulatory acceptance of alternative methods and includes updates from both the Interagency Coordinating Committee for the Validation of Alternative Methods and the European Center for the Validation of Alternative Methods. It also discusses current applications of genomics and proteomics to toxicological sciences, details the latest development in cutting edge research on engineered tissue equivalents for screening ocular injury, and explores the utility of gene array techniques in skin biology.

## **CENTER INITIATES MENTORING PROGRAM**

ECBC initiated a pilot mentoring program in October. The first test involved 13 mentor/mentee pairs. The primary purpose of the program is to provide employees growth and development opportunities through access to the experience and knowledge of more senior level employees.

## **ECBC MICROBIOLOGISTS RECOGNIZED**

Two ECBC microbiologists, Dr. Lisa Collins and Dr. Peter Emanuel, were selected among 120 nominees as two of this year's 20 finalists for the U.S. Junior Chamber of Commerce Ten Outstanding Young Americans (TOYA) Awards. The selection is held confidential until the formal national news release is distributed naming all ten winners, which was sent out on August 18, 2003. We are honored to announce that Dr. Peter Emanuel was among the winners. For the past 65 years the TOYA has recognized ten outstanding individuals, ages 21 to 39 years of age, for their personal achievements in government, business, science, athletics, and philanthropy services to their community, state or nation. Each honoree is awarded a silver medallion and the silver TOYA "Touching Hands" trophy at the awards ceremony, which was held in September. The awards ceremony pays tribute to each winner's career and provides a stage for the honorees to challenge and inspire America's youth. Among previous ECBC winners of this prestigious award is Dr. Jennifer Sekowski, an ECBC microbiologist who received the award in 2002.

## **ECBC PERSONNEL PART OF AWARD-WINNING TEAM**

The Joint Service Family of Decontamination Systems (JSFDS) team recently was recognized with the David Packard Award for Excellence in Department of Defense Acquisition. The JSFDS team was nominated for "exceptional performance, innovation, and application of best acquisition practices and outstanding program management practices." ECBC's Dr. John Weimaster, Robert Eckhaus, Bill Argiropoulos, Mike Lee, Gerald Dietz, Phillip Rankin and Richard Newton are among the scientists and engineers on the JSFDS team who contributed valuable input in scientific, logistic and operational realms. The Packard Award evaluates nominated programs for reductions in product life cycle costs; responsiveness, efficiency and timeliness of acquisition; integration of DoD personnel and practices with equivalents in the commercial sector; continuous improvement of the acquisition process; and accomplishment of goals relative to acquisition reform.

## **2003 HISPANIC ENGINEER NATIONAL ACHIEVEMENT AWARDS**

Dr. Jose Luis Sagripanti was selected as the Department of the Army nominee for the 2003 Hispanic Engineer National Achievement Awards. Congratulations to both Dr. Sagripanti and Mr. Jorge Christian, our award nominee runner up for their excellence and commitment to the U.S. Army. Dr. Sagripanti and Mr. Jorge Christian received a congratulatory memorandum signed by the Acting Functional Chief's Representative for Engineers and Scientists presented at the Hispanic Engineer National Achievement Awards Conference in October, in Austin, Texas.

# SYMPOSIA



## In April

Elaine Stewart-Craig represented ECBC's Homeland Defense Business Unit at the meeting of the **Center for Strategic and International Studies' Civil Security Working Group on "Medical Countermeasures and Protective Equipment for Individual Americans."** The panelists were Elaine Stewart-Craig, ECBC and Jennifer Brower, RAND Science and Technology. The panelists spoke and answered questions on a range of issues as they relate to the general public, including vaccination, medical prophylaxis, and individual protective equipment such as masks and protective clothing.

ECBC's Homeland Defense Business Unit provided a 90-minute technical presentation at the **2003 Michigan Homeland Security Training Conference**, in Gaylord, Michigan. Over 600 state and local first responders and public health personnel attended the conference. The presentation, titled "Concepts to Treat Mass Casualties From Terrorist Incidents," was part of the venue's medical track workshops.

Elaine Stewart-Craig attended the **National Institute of Occupational Safety and Health's Public Meeting to "Discuss Escape Respirator Standards for Respiratory Protection Against Chemical, Biological Radiological and Nuclear Agents."** The meeting was held in Pittsburgh. Most of the attendees at the meeting were representatives of manufacturers or government agencies. The National Institute of Occupational Safety and Health and ECBC presented benchmark-testing results on currently available escape hoods as well as the proposed requirements and test methods.

Dr. Steve Harden presented an invited paper entitled, "Detection, Identification and Acquisition of Vapors to Toxic Substances and Their Precursors in an Unmanned Aerial Vehicle (UAV) for Chemical Combat Assessment Applications," co-authored by Vince McHugh, Brian Ince and Gretchen Blethen at the **3rd Future Unmanned Aerial Vehicles Conference** in Arlington, VA. The paper describes the ECBC fourth detection designed chemical point detection system payload in a NRL developmental FINDER UAV and its interfacing with the aircraft. Results of several successful field tests were presented.

Dr. Akbar Khan presented a seminar entitled "Cutting Edge Biotechnology to Defend Against Bioterrorism" at

the **International Center for Genetic Engineering and Biotechnology (ICGEB)** in New Delhi, India. The ICGEB was established by the United Nations and World Health Organization to promote the safe use of biotechnology worldwide, with special regards to the needs of the developing world.

Ms. Cynthia Swim, of ECBC's Research and Technology Directorate's CB Detection Team, briefed standoff CB detection topics to the **NATO Concept Development and Experimentation (CDE) Exploratory Meeting on Standoff Detection of CB Agents**, in Vyskov, Czech Republic. Ms. Swim provided an overview of Standoff Technology Base projects, state-of-the-art systems, and the activities of the NATO Land Group 7 (LG/7) Working Group 4 (WG4) on Standoff Detection and the NATO Sensors and Electronics Technology (SET) pre-Exploratory Team on Bio Detection. A technical Preliminary Project Plan and potential National collaboration was discussed, and a Feasibility Phase Plan was drafted for the Czech-led CDE Project. Many key technical, programmatic, and personal international connections were established at the meeting to help coordinate future US and NATO efforts in the area of standoff CB detection.

Three papers describing the Disparate Sensor Integration (DSI) program at ECBC were presented at the **2003 International Society for Optical Engineering (SPIE) Conference** in Orlando FL. These papers were entitled: (1) "CB Detection and Early Warning: Fusing Disparate Sensors into the Detection Process", (2) "CB Round Discrimination using Acoustic and Seismic Data Fusion", and (3) "CB Round Discrimination: Fusing Visible and Infrared Camera Data", by A. Birenzvice, D. Sickenberger, and W. Underwood (ECBC), D. Gonski and C. Rieff (ARL), M. Fargues (Naval Postgraduate School, Monterey) and B. Nelson (Geo-Centers). The papers were presented at a special session on, Multisensor, Multisource Information Fusion: Architectures, Algorithms, and Applications 2003, with overflow attendance.

Dr. Jay Valdes, ECBC's Senior Technologist for Biotechnology, attended the **first annual meeting of the Institute for Systems Biology (ISB)**. The ISB is the recipient of a Congressional set-aside and is the leader in the new field of systems biology. Its President, Dr. Leroy Hood, is the inventor of the high throughput gene sequencing technology that enabled scientists to elucidate the complete human genome. The ISB is

developing an open source database for genomics and proteomics called “Systems Biology Experimental Analysis Management System (SBEAM).” A new module called SBEAM-SNP provides SNP (single nucleotide polymorphism) selection functionality. The proteomics and DNA array modules of SBEAMs are currently in use.

Mr. Douglas Sommerville, of ECBC’s Toxicology Team, presented the following posters at the **2003 Toxicology and Risk Assessment Conference** in Fairborn, OH: “Relationship Between the Dose-Response Curves for Lethality and Severe Effects for Chemical Warfare Nerve Agents” and “Relationship Between Toxicity Values for the Healthy Subpopulation and the General Population,” coauthored with Mr. Ronald Crosier, Standoff Detection (Passive) Team. The conference is jointly sponsored by the National Institute for Occupational Safety and Health (NIOSH), the Environmental Protection Agency (EPA), and the Department of Defense (DoD). The work presented is part of the ongoing support that Mr. Sommerville provides to his team.

Dr. Mike Jakubowski, of ECBC’s Operational Toxicology Team also presented a paper at the **2003 Toxicology and Risk Assessment Conference**. The paper, “Fluoride Ion Regeneration of Sarin (GB) from Tissue and Fluids of Minipigs as a Biometric of Whole-body GB Exposure” described recent results of low-level exposures of chemical agents in the minipig. The minipig presents a novel and useful alternative to rodent models because of its many similarities to man. This is the first report of quantifying regenerated GB in animal tissues, which is a major step in developing more powerful pharmacokinetic models to predict low-level agent exposure effects in man. This paper drew considerable interest from meeting attendees due to its quality, unique nature and applications for estimating health risks on the chemical battlefield as well as various regulatory guidelines for exposure.

In coordination with the U.S. Army Center for Health Promotion and Preventive Medicine (CHPPM), ECBC’s Protection Factor Team hosted the **2nd annual Intermediate Industrial Hygiene Course**. The topic of the course was “Respiratory Protection & Chemical Protective Clothing.” Participants learned proper testing, fitting, and wearing of chemical protective clothing and equipment.

The Military Improved Response Program (MIRP) presented a program brief to the **Department of Defense Fire and Emergency Services Working Group** at their quarterly meeting in Fairfax, VA. The briefing included updates on the program status and information regarding the Liquid Drop Contact Hazard Assessment and the Installation Fire Response Handbook that the MIRP Fire

and Emergency Services (F&ES) Functional Group is currently working on. The DoD F&ES Working Group was very receptive to the programs accomplishments to include the mutual cooperation between the MIRP and the DoD Fire Academy at Goodfellow AFB, TX. The group expressed interest in aiding the MIRP in publishing our handbook as a DoD Handbook under the auspices of DODI 6055.6, DoD Fire and Emergency Services Program. The MIRP provided a further update at their July meeting. Additionally, the Army and the Marine Corps representatives invited the MIRP to present their program information at their workshops during the International Association of Fire Chiefs/DoD Fire Conference in August.

ECBC’s Packaging Team presented “Packaging Does Affect the Warfighter” at the **Advanced Packaging Course, SMPT**. The importance of packaging during war-time deployments was emphasized and an in-depth class discussion of lessons learned and comparisons between Operation Desert Storm/Operation Iraqi Freedom was conducted.

## In May

Representatives of ECBC’s Weapons of Mass Destruction Installation Protection Team attended the **Joint Service Installation Protection Pilot (JSIPP) Conference and Workshop** in Crystal City, Virginia. The conference included representatives from Defense Threat Reduction Agency, Joint Program Executive Office-Chemical Biological Defense, the service headquarters and the nine installations participating in the pilot project. Mr. Jim Church gave a presentation on our support to the JSIPP program, which included the workshops and exercises we are providing the nine installations in FY 03-04.

Research on the environmental fate and effects of the new energetic material CL-20 is one of the SERDP-funded programs of ECBC’s Environmental Toxicology Team. The JANNAF Propellant Development & Characterization Subcommittee invited Environmental Toxicology Team scientists Dr. Ronald T. Checkai, and Dr. Roman G. Kuperman, to participate and present research results at the **JANNAF-sponsored CL-20 Technical Exchange Workshop**, in Ogden, UT. The joint services workshop, co-hosted by the Office of Naval Surface Warfare Center-Indian Head, is dedicated to promoting better understanding of new initiatives, emerging technologies, recent and emerging requirements and warfighter needs.

Mr. John Lloyd presented an invited paper: “Sampling and Identification of Biological Agents in Terrorism Events” at the **Twelfth NASA International Continuing Health Education Series on Bioterrorism**. The audience for the NASA series consisted of 14 NASA Centers/facilities,

the Uniformed Services University of the Health Sciences (USUHS); the Institute for Biomedical Problems, Moscow, Russia; Virginia Commonwealth University School of Medicine; and the Byrd Health Science Center, West Virginia University and was connected to the video teleconferencing systems set up by NASA HQ. Along with John, Kenneth Alibek, M.D., Ph.D., D.Sc., Executive Director, Center for Biodefense, George Mason University also spoke at this session.

Dr. Peter J. Stopa was an invited speaker on the Human Factors for Homeland Defense Panel at the **74th Annual Meeting of the Aerospace Medical Association** in San Antonio, TX. Dr. Stopa presented a paper on "Considerations for Effective Sampling of Biological Materials for First Responders." He also met with the conference organizers to discuss a workshop at next year's meeting for Weapons of Mass Destruction issues.

The Homeland Defense Business Unit provided a one-hour technical presentation as part of the **National Aeronautics and Space Administration's (NASA) 12th International Continuing Health Education Seminar Series**. The presentation, titled "Management and Care of Mass Casualties from a Bio-terrorism Event," was video teleconferenced to over 18 sites including NASA medical centers; the Uniformed Services University of Health Sciences (USUHS); the Institute of Biomedical Problems, Moscow, Russia; Virginia Commonwealth University School of Medicine; and the Byrd Health Science Center at West Virginia University.

## In June

Messrs. Michael Kierzewski and Douglas Sommerville, of ECBC's Modeling Simulation and Analysis Team, presented results from an analysis to three working groups at the **71st Military Operations Research Society Symposium (MORSS)** held at the Marine Corps Base in Quantico, VA. The presentation titled "Application of Comparative Testing Results Towards a Risk Analysis for Chemical Protective Gear" was given to the following working groups: WG-2, NBC Defense; WG-23, Battlefield Performance, Casualty Sustainment and Medical Planning; and WG-25, Test and Evaluation. The work arose from a tasking by the Deputy Under Secretary of the Army for Operations Research (DUSA(OR)). Coauthors on the study were: Ron Crosier, Passive Stand-Off Detection Team; Dr. Sharon Reutter, Toxicology Team; and Dr. Paul Fedele, Homeland Defense Military Improved Response Program.

ECBC's Operational Toxicology Team was tasked by the JSIG (through the Chemical School) to update and validate the human toxicity estimates to be published in FM 3-11.9. The findings/recommendations/changes were presented by

Dr. Sharon Reutter at the **CBRN Conference** and were well received. The biggest change to the revised document is the addition of concentration-time profiles, as available, because many toxicity estimates are concentration- and time- dependent and cannot be represented as a single dosage. Another significant finding was that many of the toxicity estimates contained in FM 3-9 cannot be documented, and are traceable to only tertiary sources dating to the early 1920s or earlier. A special report, "Review and Recommendations for Human Toxicity Estimates for FM 3-11.9" (Reutter et al., 2003), documents the findings and is nearing publication. A work group, sponsored by the Chemical School will be held at ECBC the week of 14 July to coordinate the final draft of FM 3-11.9.

ECBC's Dr. Dennis Reutter was invited to a workshop at the **Potomac Institute for Policy Studies** to discuss current detection technologies for weapons of mass destruction (WMD). The workshop was held as part of a study for the Defense Advanced Research Projects Agency (DARPA) to analyze current processes and means for inspection and detection of chemical, biological and nuclear weapons. The chair of the workshop is Gregory Newbold, LT Gen USMC (Ret.).

A paper on Mass Spectrometry and Allied Topics was presented at the **51st ASMS Conference** in Montreal, Canada. The paper "Determination of Sarin (GB) in Blood by Gas Chromatography-Chemical Ionization Mass Spectrometry Using Isotope Dilution and Large Volume Injection" (written by Edward M. Jakubowski, Jeffrey M. McGuire, Jennifer L. Edwards, Ronald A. Evans, Robert J. Mioduszewski, and Sandra A. Thomson) was presented by Dr. E. Michael Jakubowski of the ECBC Operational Toxicology Team describing their recent efforts to improve the analysis of nerve agents in biological matrices. This is the first report of quantifying regenerated GB in animal blood at trace levels using subambient high volume auto injection with GC/MS in the ammonia chemical ionization mode. This paper drew considerable interest from meeting attendees due to its quality, unique nature and applications for rapidly determining and potentially quantifying low-level exposure. The presentation provided the basis for discussions with representatives of the Center for Disease Control who was attending the conference. They expressed interest in collaborating with the Operational Toxicology Team in future studies.

Dr. Ronald T. Checkai, of ECBC's Environmental Toxicology Team, was the invited lead speaker for North America in the **Terrestrial Ecological Risk Assessment Symposium at the 7th International Conference on the Biogeochemistry of Trace Elements (ICOBTE)**. The 7th ICOBTE was held at Uppsala University, Uppsala,

Sweden. There were 555 delegates attending from 50 countries. Dr. Checkai spoke on the topic of Ecological Soil Screening Levels (Eco-SSL) for Ecological Risk Assessment and research efforts by his team on developing benchmark values for metal toxicity to soil invertebrates. Dr. Checkai is the U.S. Army Eco-SSL Steering Committee Representative and a National Task Group Co-Chair. The National Eco-SSL effort represents collaboration among the U.S. Environmental Protection Agency (USEPA), the U.S. Department of Defense (DoD), the U.S. Department of Energy (DOE), States, universities, and industry.

Dr. Sanjiv Shah of ECBC's Biosensors Team presented a poster entitled "Multiplex TaqMan-PCR for Rapid, Sensitive and Real-Time Identification of Biological Warfare Agents" at the **3rd Annual Biodetection Technologies 2003 International Symposium** held in Arlington, VA. The team has expanded its TaqMan-PCR assay development effort for the real-time detection of BW agents on two fronts. The first effort involves the development of optimized multiplex TaqMan-PCR assays that make it possible to detect up to four sequence-specific targets in a single reaction tube. The assays can be designed to identify a single BW agent by targeting multiple gene targets, thus increasing assay specificity, or for the identification of four different BW agents using single gene targets. Another significant accomplishment is the design of hybridization-based fluorogenic real-time PCR techniques for the identification of BW agents. The two techniques examined so far are molecular beacons, and adjacent dual probes. A third kind of probe, known as the Scorpion probe, is currently being evaluated. The study of these two technologies demonstrated a performance that is comparable to that of the TaqMan-PCR, making them possible alternatives for TaqMan-PCR. These promising results were presented in poster format under the name "Rapid Identification of Bacillus anthracis by Three Different Real-Time PCR Techniques" by Ms. Janet Nowakowski, and Mr. Jose Alvelo. The posters stirred the interest of international members of the Biodefense

community.

## In August

A poster presentation based on recently published CDC manual entitled, "Guidance on the Use of Filtration and Air-Cleaning Systems for Protecting Building Environment from Airborne Chemical, Biological, or Radiological Attacks", was awarded "Best of Session" at the **American Industrial Hygiene Conference and Exhibition (AIHce)** 2003 meeting held in Dallas, TX. The guidance manual was co-authored by Chris Karwacki, Bob Morrison, and David Tevault of ECBC.

Members from ECBC's Military Improved Response Program Law Enforcement Functional Team attended the **2003 "TREXPO" Conference**, held in Chantilly, VA. A presentation was given by members of the team, along with the Maryland State Police, on "Law Enforcement Response to Chemical Terrorism." Members of the team also manned a booth to describe our work on law enforcement issues and to distribute information that has been developed by the law enforcement functional group of the team.

## Upcoming

Dr. R.R. Smardzewski and his co-P.I. investigator (Dr. Art Snow, Naval Research Laboratory) had two papers accepted for presentation at the **50th American Vacuum Society (AVS) International Symposium**, 2-7 Nov 2003, Baltimore, MD. Titles are "Chemical-Biological Nanosensors" and "A Portable GC with a Nanosensor Array Detector." Both papers will be presented in Session HS3 of the Special Topical Conference on Homeland Security.

Dr. Dennis Reutter has been invited to chair a session on Chemical Forensics at the **Gordon Research Conference** titled "Chemical and Biological Terrorism Defense". The conference is slated to be held January 18-21 2004.

## Upcoming Conferences

Date and Place	Title	POC
17-20 November 2003 Sheraton Baltimore North Towson, MD	2003 Joint Service Scientific Conference on Chemical and Biological Defense Research	(410) 436-4883
12-15 January 2004 Arlington, VA	12th International Conference On-site Analysis@..The Lab Comes to the Field	www.ifpac.com/onsite

# PUBLICATIONS



## BOOKS, JOURNALS AND MAGAZINE ARTICLES

*Military Medical Technology* published an ECBC Homeland Defense Business Unit article in its April 2003 issue. The article, titled “Mass Casualty Predictions: By the Numbers,” describes an approach for estimating casualties from a biological attack of airborne anthrax. The article was co-authored by Mohamed Mughal; Richard Hutchinson, PhD (SBCCOM, retired); LTC George Christopher, USAF, MC (Chief, Department of Medicine, Landstuhl Regional Medical Center); and Robert Gougelet, MD (Assistant Professor, Department of Emergency Medicine, Dartmouth Hitchcock Medical Center).

A paper entitled “A simple and rapid fluorescence-based immunoassay for the detection of staphylococcal enterotoxin B” has been accepted for publication in *Molecular and Cellular Probes*. The paper describes a simple, fast and highly sensitive fluorescence based immunoassay for detection of staphylococcal enterotoxin B.

The manuscript “Detection, Identification and Estimation of Biological Aerosols and Vapors with Fourier Transform Infrared Spectrometer” by Avishai Ben-David and Hsuan Ren was accepted for publication in the peer-review *Journal of Applied Optics*. Two experiments are conducted with a Fourier Transform InfraRed (FTIR) spectrometer. The first experiment is to detect and identify *Bacillus subtilis* var. niger (BG) bio-aerosol spores and kaolin dust in an open-air release where the thermal contrast is small. The second experiment is to estimate the concentration of a small amount of TriEthyl Phosphate (TEP) vapor in a closed chamber where an external blackbody radiation source is used and where the thermal contrast is large. The deduced BG (TEP) extinction spectrum (identification) shows an excellent match to the library BG (TEP) extinction spectrum. Analysis of the time sequence of the measurements coincides very well with the presence (detection) of the BG during the measurements and the estimation of the TEP vapor time-dependent concentration is excellent. The data is analyzed with new hyperspectral detection, identification and estimation algorithms. The algorithms are based on radiative transfer theory and statistical signal processing methods and produce detection threshold, probability of detection and probability of false alarm. The results of this study are encouraging, as they suggest for the first time the feasibility of detecting biological aerosols with passive FTIR sensors.

*Homeland Defense Journal* published a Homeland Defense Business Unit article in its 24 Feb 03 issue. The article, titled “Involving the Army’s Research, Development and Engineering Centers in Homeland Defense,” describes the business unit and its mission focus. The journal has a wide distribution including private industry and state and local governments.

Members of the CBR Filtration Team have co-authored a report sponsored by the *Center for Disease Control and Prevention* entitled, “Guidance for Filtration and Air-Cleaning Systems to Protect Building Environments from Airborne Chemical, Biological, and Radiological Attacks.” The pamphlet includes sections describing the principles of air filtration, recommendations regarding filter selection for building protection applications, and the attendant economic considerations, and is intended for use as guidance to building owners and operators for design of filtration systems to protect occupants in case of external CBR attack

## TECHNICAL REPORTS

Published technical reports, when available, should be requested from the Administrator, Defense Technical Information Center, ATTN: DTIC-FDRB, 8725 John J. Kingman Road, Ste 0944, FT Belvoir, VA 22060-6218.

Report No.	Title
ECBC-CR-060	Effect of Ambient Temperature on Oil Smoke Simulation in COMBIC, May 2003, UNCLASSIFIED - limited.
ECBC-SP-016	Biological Detection Market Survey, April 2003, UNCLASSIFIED - limited.
ECBC-TN-013	Characteristics and Sampling Efficiencies of Bioguardian Aerosol Samplers, March 2003, UNCLASSIFIED - public release.
ECBC-TN-014	Characteristics and Sampling Efficiencies of Aerosol Samplers Manufactured by Mesosystems Technology, Inc., March 2003, UNCLASSIFIED - public release.
ECBC-TR-263	Assembled Chemical Weapons Assessment (ACWA) Program Immobilized Cell Bioreactor Toxicity Monitoring, June 2003, UNCLASSIFIED - public release.
ECBC-TR-271	Early Detection of Chemical/Biological Attack Using Disparate Sensors, April 2003, UNCLASSIFIED - limited.
ECBC-TR-273	Test Results of Air-Permeable Charcoal Impregnated Suits to Challenge by Chemical and Biological Warfare Agents and Simulants: Executive Summary, May 2003, UNCLASSIFIED - public release.
ECBC-TR-274	Test Results of Air-Permeable Charcoal Impregnated Suits to Challenge by Chemical and Biological Warfare Agents and Simulants: Summary Report, May 2003, UNCLASSIFIED - public release.
ECBC-TR-275	Domestic Preparedness Program: Testing of the Scentoscreen Gas Chromatograph Instrument Against Chemical Warfare Agents Summary Report, April 2003, UNCLASSIFIED - public release.
ECBC-TR-276	Toxicological Evaluation of Compounds EA 5775-EA 5778 in Rabbits and EA 5779-EA 5787 in Mice (FY 81), July 2003, UNCLASSIFIED - limited.

ECBC-TR-279	Toxicology of EA 5700 in the Rabbit, July 2003, UNCLASSIFIED - limited.
ECBC-TR-280	Domestic Preparedness Program: Sarin Vapor Challenge and Corn Oil Protection Factor Testing of Commercial Air-Purifying Negative Pressure Respirators, May 2003, UNCLASSIFIED - public release.
ECBC-TR-281	Domestic Preparedness Program: Evaluation of the Agilent GC-FPD/MSD (Gas Chromatograph - Flame Photometric Detector/Mass Selective Detector) System Against Chemical Warfare Agents, Summary Report, May 2003, UNCLASSIFIED - public release.
ECBC-TR-282	Chemical Analysis and the Reaction Kinetics of EA-2192 in Decontamination Solution for the MMD-1 Project, May 2003, UNCLASSIFIED - public release.
ECBC-TR-284	Evaluation of Small-Scale Cell Culture Methods for the Production of Monoclonal Antibodies, July 2003, UNCLASSIFIED - limited.
ECBC-TR-286	Bioterrorism: Facts & Fiction Issues and Problems, March 20003, UNCLASSIFIED - limited.
ECBC-TR-287	Intravenous Toxicity in Male ICR Mice of Selected EA Compounds (EA 5856 - EA 5872) and CS 849944 - CS 849946 During FY84, July 2003, UNCLASSIFIED - limited.
ECBC-TR-288	Reactive Sorbents: Synthesis of Phase-Transfer Catalytic Polymers for CW Agent Decontamination, May 2003, UNCLASSIFIED - limited.
ECBC-TR-289	Electronic Structure and Interpretation of the Vibrational Spectra of Isopropyl Methylphosphonofluoridate (GB), May 2002, UNCLASSIFIED - limited.
ECBC-TR-290	Laser Standoff Detection of Liquid Chemical Agent Embedded in a Porous Substrate, May 2003, UNCLASSIFIED - limited.
ECBC-TR-292	Domestic Preparedness: Phase 2 Sarin Vapor Challenge and Corn Oil Protection Factor (PF) Testing of Commercial Powered Air Purifying Respirator (PAPR) Systems and Cartridges, April 2003, UNCLASSIFIED - public release.

ECBC-TR-293	Chemical Characterization of the Pyrotechnically Disseminated M8-PE Smoke Pots, May 2003, UNCLASSIFIED - public release.
ECBC-TR-295	Test Results of Phase 3 Level B Suits to Challenge by Chemical and Biological Warfare Agents and Simulants: Executive Summary, May 2003, UNCLASSIFIED - public release.
ECBC-TR-297	Quantitative Infrared Reference Library Volume I, July 2003, UNCLASSIFIED - public release.
ECBC-TR-298	Chemical Warfare Material Detection With Infrared Spectroscopy TravelIR by SensIR, Inc., July 2003, UNCLASSIFIED - limited.
ECBC-TR-299	Chemical Characterization of the Pyrotechnically Disseminated M83-PE Smoke Grenades, June 2003, UNCLASSIFIED - public release.
ECBC-TR-300	Mini-Flow Cytometer Studies, July 2003, UNCLASSIFIED - limited.
ECBC-TR-303	Frequency Agile Laser (FAL) Data Acquisition System: Hardware and Software System Modification, June 2003, UNCLASSIFIED - public release.
ECBC-TR-304	Vapor Pressure of GF, June 2003, UNCLASSIFIED - public release.
ECBC-TR-305	Volatility of DMMP in Humid Air, June 2003, public release.
ECBC-TR-307	Testing of HAZMATCAD Detectors Against Chemical Warfare Agents: Summary Report of Evaluation Performed at Soldier Biological and Chemical Biological and Chemical Command (SBCCOM), May 2003, UNCLASSIFIED - public release.
ECBC-TR-311	Evaluation of Industrial Processes for V Agent Production, May 2003, UNCLASSIFIED - public release.
ECBC-TR-315	Chemical Weapons Convention Verification Technology Research and Development, Evaluation of a Proposed Joint U.S./Finnish Method for Extraction of Chemical Agents and Their Degradation Products From Wipe Samples, May 2003, UNCLASSIFIED - limited.

ECBC-TR-317	Computational Studies on Lewisite and Other Arsenic Chloride, June 2003, UNCLASSIFIED - public release.
ECBC- TR-320	Domestic Preparedness: Phase 2 Sarin Vapor Challenge and Corn Oil Protection Factor (PF) Testing of Commercial Air-Purifying Negative Pressure Respirators, June 2003, UNCLASSIFIED - public release.
ECBC-TR-322	Recirculation Filter Unit Acceptance Test Development, July 2003, UNCLASSIFIED - limited.
ECBC-TR-334	Chemical Agent Hydrolysis on Dry and Humidified Adsorbents, July 2003, UNCLASSIFIED - public release.





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